ProxyServer
Internet Access Server

Internet Access for LAN-Based Users

Model MTPSR3-100

User Guide

MultiTech® Systems

User Guide

S0000000 Revision B

Serial ProxyServer (Model No MTPSR3-100)

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Record of Revisions

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B 11/23/99	Appendix A updated to show WAN cable diagram; all pages at Rev B.

Patents

This Product is covered by one or more of the following U.S. Patent Numbers: **5.301.274; 5.309.562**; **5.355.365; 5.355.653; 5.452.289; 5.453.986**. Other Patents Pending.

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Chapter 1 - Introduction and Description

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Introduction

Welcome to Multi-Tech's new Serial ProxyServer, model MTPSR3-100, a single, secure gateway that provides multiple LAN users with high performance Internet access. The ProxyServer functions as a TCP/IP proxy server that resides on the outer edge of your firewall. It features a 10BaseT port for your local LAN connection, command port for local console configuration and management, and three serial ports for connection to external Data Communications Equipment (DCE), such as modems or ISDN. The serial ports are capable of being bonded together using MultiLink Point-to-Point Protocol (MLPPP). MLPPP allows the bandwidth of each DCE device to be multiplied by the number of devices connected to the serial ports. System management is provided by an easy to use Windows® CD based install wizard.

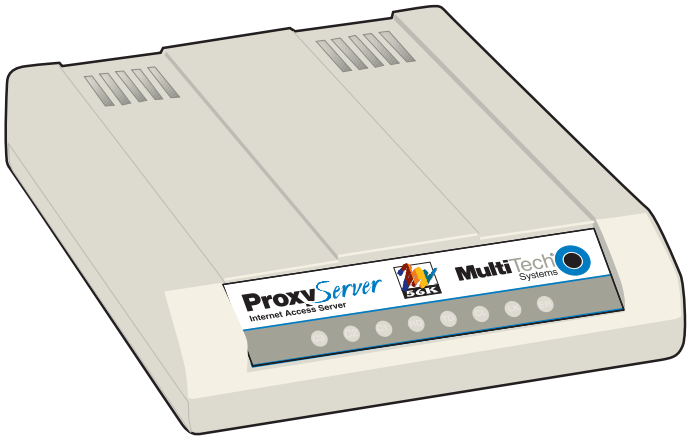


Figure 1-1. ProxyServer

Preview of This User Guide

This guide describes the ProxyServer and tells you how to install and configure the unit. The information contained in each chapter is as follows:

Chapter 1 - Introduction and Description

Chapter 1 describes the ProxyServer 100-Series. A description of the front panel indicators, back panel connectors are provided. A list of relevant specifications is provided at the end of the chapter.

Chapter 2 - Installation

Chapter 2 provides information on unpacking and cabling your ProxyServer. The installation procedure describes each cable connection.

Chapter 3 - Software Loading and Configuration

Chapter 3 details the software loading and initial configuration. The ProxyServer software CD is Windows® based. Later chapters, as well as your online Help describe the software in more detail.

Chapter 4 - ProxyServer Software

Chapter 4 describes the ProxyServer software with the approach of how to make changes to the configuration of your ProxyServer. The major configuration parameters were established during the loading of the software (Chapter 3), and the ProxyServer software and configuration utilities allow you to make changes to that initial configuration. For explanations and parameters of each field within a dialog box, please refer to the online Help provided with the software.

Chapter 5 - Client Setup

Chapter 5 provides information for enabling and configuring multiple Windows 95/98 and NT® PC users for Internet access via the ProxyServer.

Chapter 6 - Service, Warranty and Tech Support

Chapter 6 provides instructions on getting service for your ProxyServer at the factory, a statement of the limited warranty, information about our Internet presence, and space for recording information about your ProxyServer prior to calling Multi-Tech's Technical Support.

Front Panel Description

The front panel contains LEDs that provide the status of the three channels, receive and transmit data indicators that define transmission of data to and from the channels and the LAN. The Collision and Link indicators provide status of the LAN, and the Boot indicator lights when the unit is rebooting. An On/Off switch is provided on the right side near the rear of the unit.

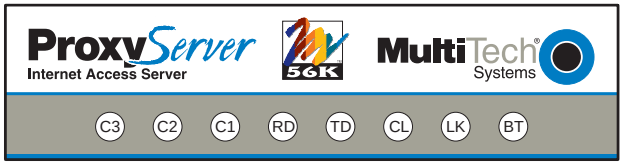


Figure 1-2. Front Panel

C*x* The Channel indicators light indicating activity on the associated serial channel (i.e., C3 for channel 3, C2 for channel 2, and C1 for channel 1).

RD Receive Data indicator blinks when packets are being received from either the local area network or one of the serial channels.

TD Transmit Data indicator blinks when packets are being transmitted to either the local area network or one of the serial channels.

CL Collision indicator lights when a collision is in progress; that is, when two nodes are transmitting packets at the same time.

LK Link indicator lights indicating that the ProxyServer is connected to the local area network.

BT Boot indicator lights when the ProxyServer is loading configuration data either from an initial power on or a download setup was initiated.

Back and Side Panel Descriptions

The cable connections for the ProxyServer are made at the back panel. In addition to the Power (PWR) connector, three groups of connectors are used on the ProxyServer: the Command Port (CMD), Ethernet (LAN) and WAN Links (WAN1, 2 and 3). The connectors are shown in Figure 1-3 and then described.

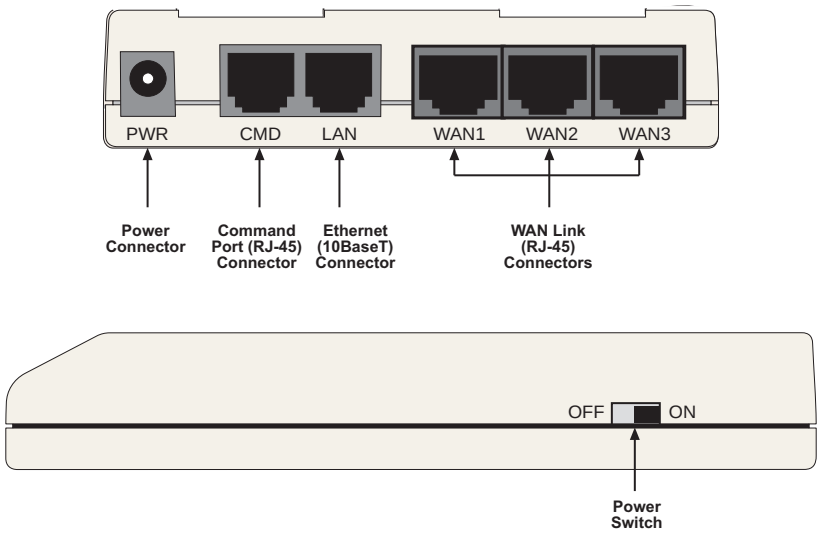


Figure 1-3. Back and Side Panels

Power Connector

The Power connector (PWR) is used to connect the external power supply to the ProxyServer.

Command Port Connector

The Command connector (CMD) is used to configure the ProxyServer using a PC with a serial port and running Windows® software. The Command connector is an RJ-45 jack and is used with the RJ-45 to DB-9 command port cable provided with your ProxyServer. The command port is only used to connect the ProxyServer directly to the PC for local configuration and management.

Note: If your PC has a DB-25 (25-pin) serial port connector, you will need to obtain a DB-9 (9-pin, male) to DB-25 adapter. Connect the DB-25 end of this adapter to the serial port on your PC, and then connect the DB-9 (9-pin, female) end of the Command Port cable to the adapter.

Ethernet 10BaseT Connector

The Ethernet 10BaseT connector (LAN) is used to connect the ProxyServer to a LAN using unshielded twisted cable. This connector is an RJ-45 connector.

WAN Link Connectors

The WAN Link connectors (WAN1, WAN2, WAN3) are used to connect the ProxyServer to a WAN. These connectors are RJ-45 connectors.

Power Switch

The Power switch is located on the right side of the chassis. Settings are ON (switch moved toward the rear of the unit) and OFF (switch moved toward the front of the unit).

Specifications

Protocols	Point-To-Point Protocol (PPP), MultiLink Point-To-Point Protocol (MLPPP), and Serial Line Internet Protocol (SLIP)	
Ethernet Lan Interface	10BaseT (twisted pair) RJ-45 connector	
WAN Interface	3 asynchronous Links (RJ-45 connectors)	
Command Port	Single 19.2K bps asynchronous Command Port (uses a short RJ-45 to DB-9 cable to connect directly to PC)	
WAN Links	Three asynchronous serial ports support up to 230K per port, and MultiLink Point-to-Point Protocol (MLPPP)	
Electrical/Physical	*Voltage*	- 115 V AC (Standard) 240 V AC (Optional)
	Frequency	- 47 to 63 Hz
	Power Consumption	- 700 mA
	Dimensions	- 1.625" high x 6" wide x 9" deep 5.63cm high x 22.34cm wide x 33.51cm deep
	Weight	- 2 pounds .92 kg
Requirement	PC with Windows 3.1, 95/98 or NT	

A Typical Internet Application

A typical Internet application is shown in Figure 1-4. In this example, the workstations are tied to the HUB (LAN) and the ProxyServer is connected to the HUB via an unregistered IP Address. The WAN ports were all configured to connect to an external Data Communications Equipment (DCE) device that was connected to the ISP during the loading of the software.

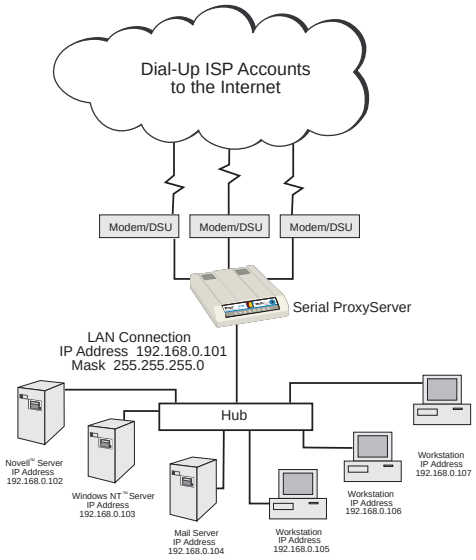
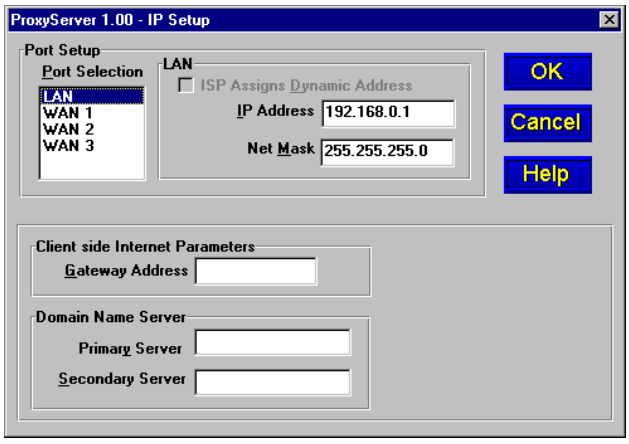


Figure 1-4. Typical Internet Application

Now, let's talk about some of the specifics that make this application work. Before the workstations can access the Internet, they have to have an IP stack loaded on the workstation and pointed toward the Proxy Server. The procedures for loading the IP stack are provided in the Chapter 5 - Client Setup.

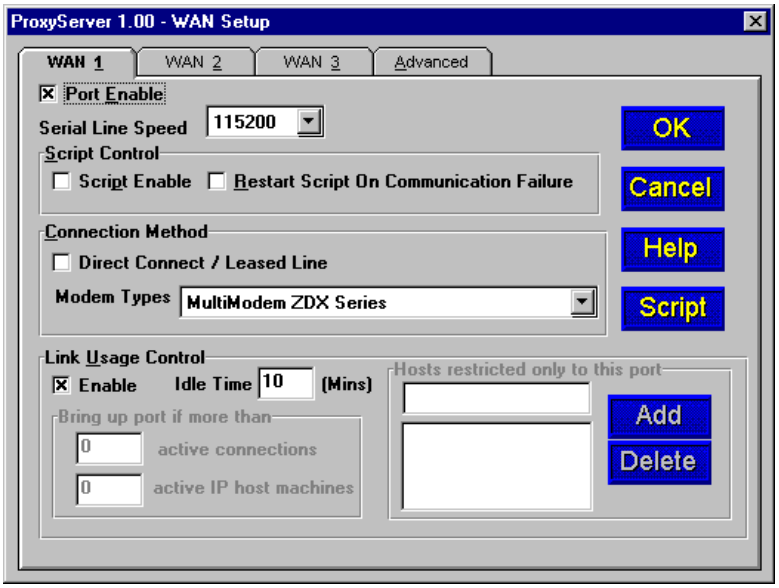
When the ProxyServer software is loaded and the ProxyServer configured, two approaches can be considered for the IP address of the WAN ports that connect to the ISP. The ISP can dynamically assign the IP address to the ProxyServer or the ISP can assign a fixed IP address for the ProxyServer. Probably, the most common approach would be for the ISP to dynamically assign the IP address, since registered IP addresses are becoming a premium. Since the IP addressing is established during the loading and configuring of the ProxyServer, it is recommended that you determine the desired addressing scheme prior to installing the software (see Chapter 3).

After initial configuration (e.g., Wizard Setup) you can view or change the IP Setup parameters for the LAN and WAN ports by selecting the IP button on the Proxy Setup dialog box (see Chapter 4 - ProxyServer Software for a full description of software features).



The ProxyServer supports scripting on any WAN ports that are configured as asynchronous. This feature can be very useful when some special handling has to be done on the WAN port (e.g., extra authentication, special communications equipment, etc.). On the WAN Setup dialog box, click on the **Script** button to create or edit a script for the WAN port.

A list of the Script commands by function, and an example of a typical script is provided in Appendix B - Script Commands. You can click on the *Script Enable* option to activate a script for the selected WAN port. You can also enable *Restart a Script On Communication Failure* by clicking on this option on the WAN Setup dialog box.



Refer to Chapter 4 - ProxyServer Software for more details on configuring your ProxyServer.

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Chapter 2 - Installation

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Introduction

This chapter is organized to guide you through the unpacking and installation of your ProxyServer. The unpacking section describes the contents of the shipping box and shows how the ProxyServer is packaged. The cabling section describes each cable connection and shows where that cable is connected to the ProxyServer. Software loading and installation will be covered in Chapter 3.

Unpacking Your ProxyServer

The shipping box contains:

- ProxyServer (1)
- Quick Start Guide (1)
- ProxyServer CD with the ProxyServer Software and User Guide in Adobe Acrobat™ format (1)
- RJ-45 to DB-25 cables (3)
- external power supply (1)
- RJ-45 to DB-9 Command Port cable (1)

Inspect the contents for signs of any shipping damage. If damage is observed, do not power up the unit, contact Multi-Tech's Technical Support for advice (refer to Chapter 6). If no damage is observed, place the ProxyServer in its final location and perform the Cabling procedures that follow.

Save the shipping box in case reshipment is necessary.

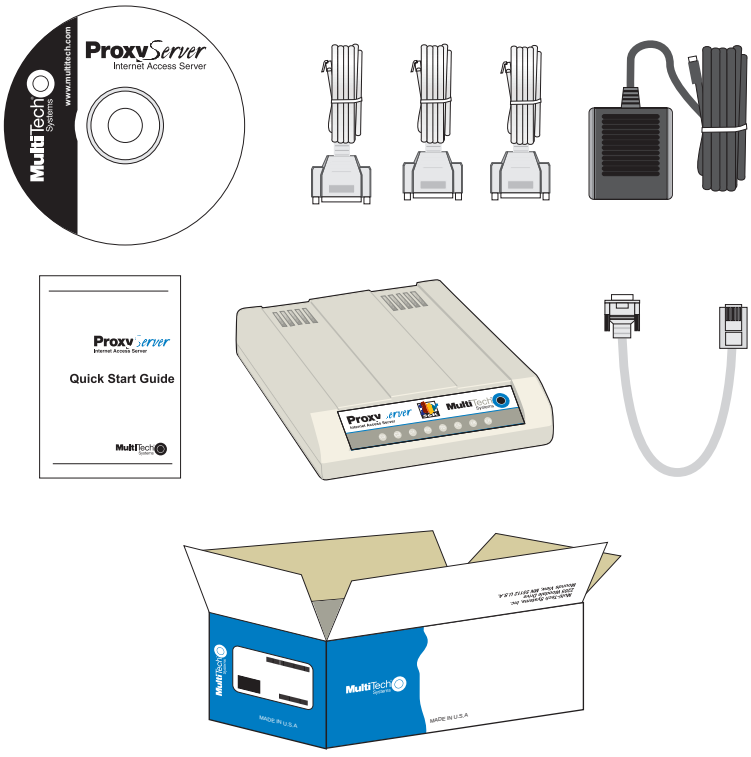

Figure 2-1. Unpacking

Cabling Your ProxyServer

Cabling your ProxyServer involves making the proper Power (PWR), Ethernet (LAN), and WAN (WAN1, 2, 3) connections. Figure 2-2 shows the back panel connectors and the associated cable connections. The procedures that follow detail the process of making each connection.

Note: The Command (CMD) port connection is used to connect a PC directly to the ProxyServer for local configuration and management. The CMD port does not need to be used to set up and configure the unit.

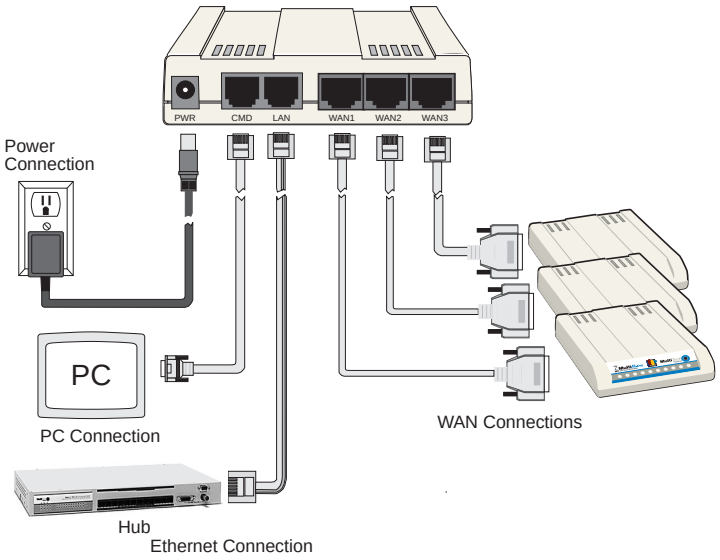

Figure 2-2. Back Panel Connections

Step	Procedure
1	Verify that the ON/OFF switch, located on the right side panel of the ProxyServer, is set to the OFF position (toward the front of the unit).
2	Connect the external power supply (included with the ProxyServer) to a live AC outlet and to the power connector (PWR) on the back panel of the ProxyServer. See Figure 2-2.
3	Make the network connection by connecting an RJ-45 (UTP) cable (you supply) to the LAN connector on the back of the ProxyServer. Connect the other end of the cable to your LAN.
4	Connect the three short RJ-45 to DB-25 cables (included with the ProxyServer) between the WAN ports on the ProxyServer and the serial port on the DCE devices (i.e., modem or DSU). See Figure 2-2.
5	Turn on power to the ProxyServer by placing the ON/OFF switch to the ON position (toward the back of the unit). Wait for the Boot LED (BT) to go off before proceeding. This may take a couple of minutes.

At this time your ProxyServer is completely cabled. Proceed to Chapter 3 to load the ProxyServer software and run the Wizard Setup.

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Chapter 3 - Software Loading and Configuration

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Loading Your ProxyServer Software

The ProxyServer software and User Guide are contained on the ProxyServer CD. The CD is auto-detectable, so when you insert it into your CD ROM drive it will start up automatically. When you have finished configuring your ProxyServer, you can view and print the User Guide by clicking on the Install Manuals icon.

1 Before you begin installing the software, you need to determine how you are going to configure your ProxyServer, via the LAN or connected directly to the command port. If you are configuring your ProxyServer via your network, you need to have your PC configured for network communications (i.e., TCP/IP stack loaded) and this PC and the ProxyServer must be on the same physical LAN segment. If you need to load the TCP/IP stack, refer to the Chapter 5 - Client Setup.

2 Insert the ProxyServer CD into your CD ROM drive. The CD is auto-detectable, so it starts automatically. It may take 10 to 20 seconds for the Multi-Tech Installation CD screen to appear.

Note: If your system is not configured to support autorun, you can start the Installation CD by browsing the contents using My Computer (on your Windows desktop). Double click on **My Computer**. Right click on the **CD ROM drive icon** and select **Open**. Double click on **Autorun.exe**.

The Multi-Tech Installation CD screen appears.

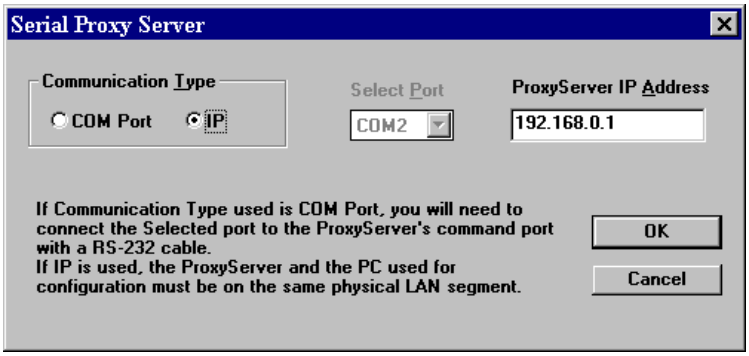
3 Click **Install Software**. The Welcome screen is displayed.

Welcome
Welcome to the Serial Proxy Server Setup program. This program will install Serial Proxy Server on your computer.
It is strongly recommended that you exit all Windows programs before running this Setup program.
Click Cancel to quit Setup and then close any programs you have running. Click Next to continue with the Setup program.
WARNING: This program is protected by copyright law and international treaties.
Unauthorized reproduction or distribution of this program, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under law.
Next >
Cancel

4 Press **Enter** or click **Next>** to continue.

5 Follow the on-screen instructions to install your ProxyServer software.

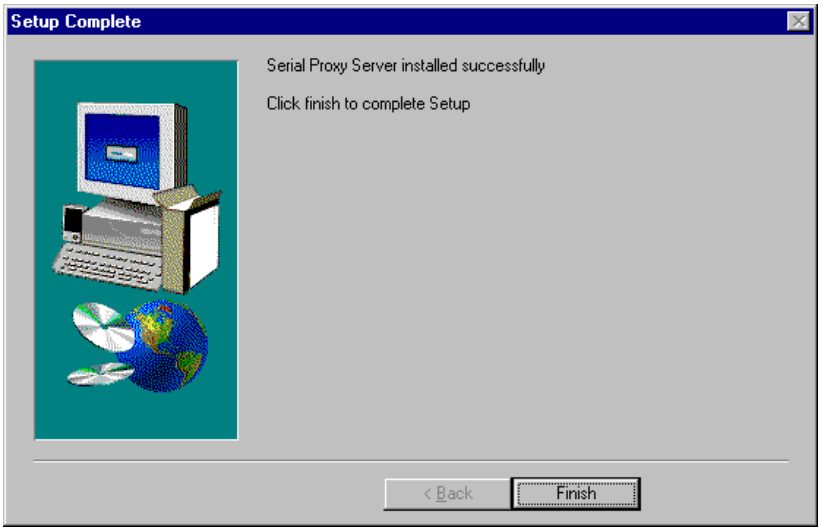
6 Once the software is loaded, the **Serial Proxy Server** dialog box asks if you are configuring your ProxyServer over the LAN or directly connected to the Command port.


Serial Proxy Server
Communication Type
COM Port
IP
Select Port
COM2
ProxyServer IP Address
192.168.0.1
If Communication Type used is COM Port, you will need to connect the Selected port to the ProxyServer's command port with a RS-232 cable.
If IP is used, the ProxyServer and the PC used for configuration must be on the same physical LAN segment.
OK
Cancel

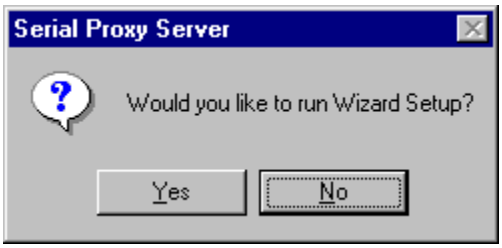
If you are configuring the ProxyServer via your network, click **OK** to continue.

If you need to configure your ProxyServer via the Command port, follow the instructions in the dialog box for selecting the **COM Port** and click **OK** to continue.

The **Setup Complete** dialog box is displayed.



7 Click **Finish** to continue. The following dialog is displayed.



Proceed to the next section, **Wizard Setup**, to continue the software configuration

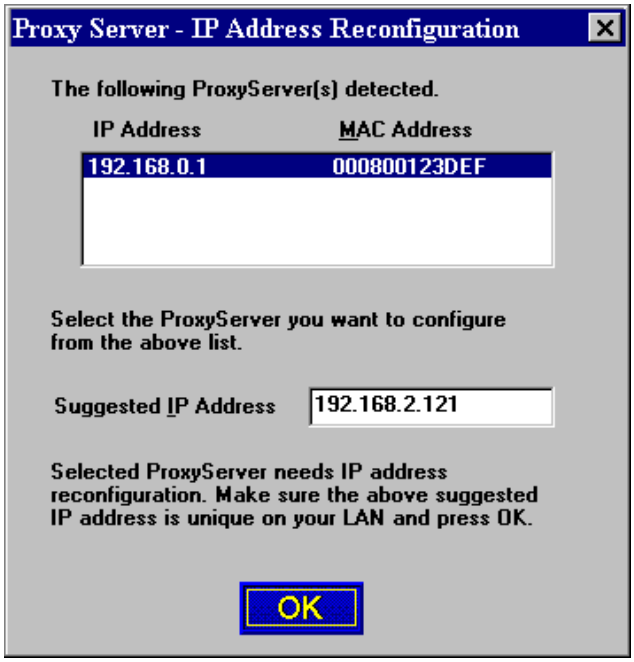
Wizard Setup

The Wizard Setup provides you with a process to input the basic configuration information needed to configure your ProxyServer. The Wizard Setup will guide you through the configuration of your LAN address and net mask information, and through the WAN, DHCP Server, and Domain Name Server configuration. Once configured, all entries will also be shown in their respective dialog boxes, as accessed through the Proxy Setup utility (see Chapter 4 - ProxyServer Software for a description of the Proxy Setup utility). To proceed with the Wizard Setup:

8 Click **Yes** to run the Wizard Setup.

Clicking **No** takes you to the program group (icons) which allows you to choose a utility from the program group.

9 If you are configuring your ProxyServer via the network, the **IP Address Reconfiguration** dialog box is displayed showing the default IP and MAC addresses in the top window and a Suggested IP Address in the lower window.


Proxy Server - IP Address Reconfiguration
The following ProxyServer(s) detected.
IP Address
MAC Address
192.168.0.1
000800123DEF
Select the ProxyServer you want to configure from the above list.
Suggested IP Address
192.168.2.121
Selected ProxyServer needs IP address reconfiguration. Make sure the above suggested IP address is unique on your LAN and press OK.
OK

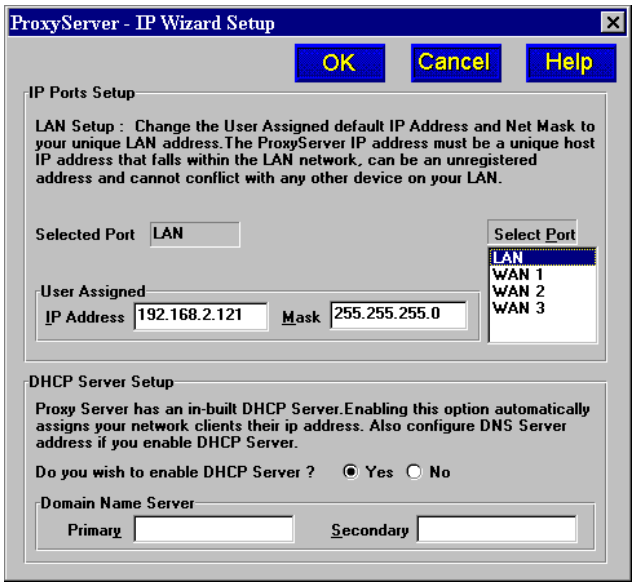
The **Suggested IP Address** is only a suggestion and you should verify that this address does not conflict with any other device on your network. **If this address conflicts, change it to a unique address** for your ProxyServer.

10 Click **OK** when you are ready to continue. The **IP Wizard Setup** dialog is displayed.

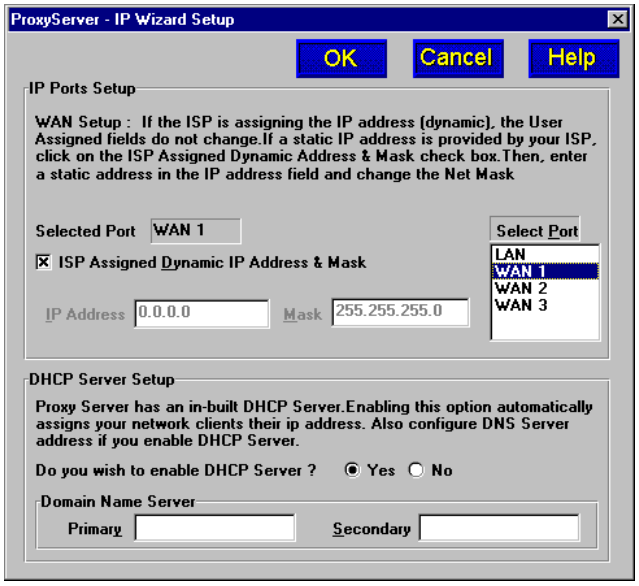
IP Wizard Setup

The **IP Wizard Setup** dialog guides you through the assignment of LAN and WAN IP address information. In addition, this dialog aids in determining whether or not your LAN is already running a DHCP Server (which automatically assigns client IP addresses). If not, and if you want to enable the built-in DHCP Server in the ProxyServer, you do so through this dialog. If you enable the ProxyServer's DHCP server, you should also enable the Domain Name Server, as instructed in the Wizard.

11 By default, the **LAN** port is highlighted. Follow the on-screen instructions to configure the IP address and subnetwork mask for the LAN port.


ProxyServer - IP Wizard Setup
OK
Cancel
Help
IP Ports Setup
LAN Setup : Change the User Assigned default IP Address and Net Mask to your unique LAN address.The ProxyServer IP address must be a unique host IP address that falls within the LAN network, can be an unregistered address and cannot conflict with any other device on your LAN.
Selected Port LAN
Select Port
LAN
WAN 1
WAN 2
WAN 3
User Assigned
IP Address 192.168.2.121
Mask 255.255.255.0
DHCP Server Setup
Proxy Server has an in-built DHCP Server.Enabling this option automatically assigns your network clients their ip address. Also configure DNS Server address if you enable DHCP Server.
Do you wish to enable DHCP Server ? Yes No
Domain Name Server
Primary
Secondary

11 Highlight **WAN 1** in the **Select Port** group.


ProxyServer - IP Wizard Setup
OK
Cancel
Help
IP Ports Setup
WAN Setup : If the ISP is assigning the IP address (dynamic), the User Assigned fields do not change.If a static IP address is provided by your ISP, click on the ISP Assigned Dynamic Address & Mask check box.Then, enter a static address in the IP address field and change the Net Mask
Selected Port WAN 1
Select Port
LAN
WAN 1
WAN 2
WAN 3
ISP Assigned Dynamic IP Address & Mask
IP Address 0.0.0.0
Mask 255.255.255.0
DHCP Server Setup
Proxy Server has an in-built DHCP Server.Enabling this option automatically assigns your network clients their ip address. Also configure DNS Server address if you enable DHCP Server.
Do you wish to enable DHCP Server ? Yes No
Domain Name Server
Primary
Secondary

12 The dialog box changes to guide you through setting up the WAN ports. Follow the on-screen instructions to configure the WAN 1 port IP parameters. Then Highlight **WAN 2** and then **WAN 3** to configure the other WAN ports.

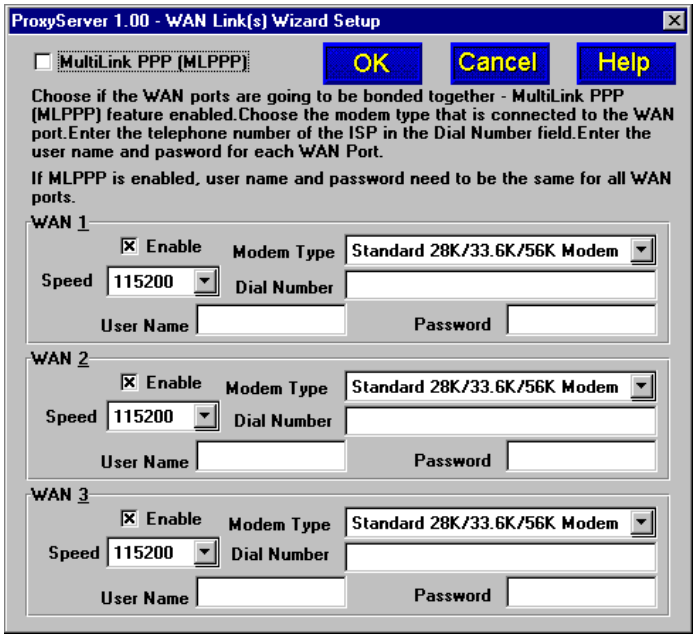
13 Click **OK** when you are satisfied with the IP configuration. The **WAN Link(s) Wizard Setup** dialog is displayed.

WAN Link(s) Wizard Setup

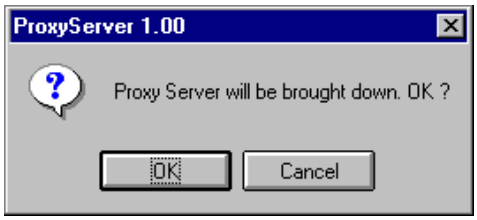
The WAN Link(s) Wizard Setup guides you through two main processes. First you are instructed to enable (if you choose) MultiLink Point to Point Protocol (MLPPP), which binds the WAN ports together. And second, you are guided through the configuration of each WAN link, including the determination of the Data Communications Equipment (DCE) device type attached to each link (modem, DSU, etc.), and the configuration of the User Name, Password and Dial Number (all negotiated with the ISP providing the Internet access).

Note: As noted in the Wizard, in order to use MLPPP, the User Name and Password for all WAN ports must be identical.

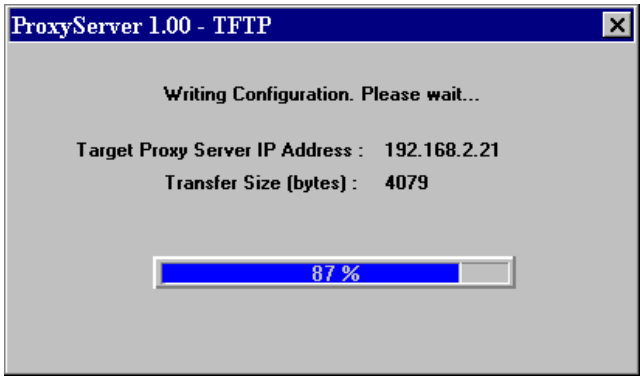
14 Follow the on-screen instructions to set up your WAN ports.



15 Click **OK** to finish installing the software. The following dialog box is displayed.



16 Click **OK** to download load the new configuration. The following dialog box is displayed as the configuration is written to the ProxyServer.


ProxyServer 1.00 - TFTP
Writing Configuration. Please wait...
Target Proxy Server IP Address : 192.168.2.21
Transfer Size (bytes) : 4079
87 %

17 During the reboot, the **BT** (Boot) LED will be on. Wait for the **BT** LED to go off before proceeding. Once the configuration has been written to the ProxyServer, you are returned to the Multi-Tech Installation CD screen.

At this time your ProxyServer is fully operational. It is recommended that you verify that each client PC has an IP stack loaded, workstation IP address assigned, gateway pointed to the ProxyServer, and that the DNS name(s) supplied by the ISP are entered. Refer to Chapter 5 - Client Setup for more details. Once verified, your clients are ready to access the Internet.

ProxyServer
Internet Access Server

Chapter 4 - ProxyServer Software

MultiTech Systems

Introduction

This chapter describes the ProxyServer software with the intent to show you how to make changes to the configuration of your ProxyServer. The major configuration parameters were established during the loading of the software (Chapter 3), and the ProxyServer software and configuration utilities allow you to make changes to that initial configuration.

The ProxyServer software allows you to refine your configuration based on your network connections. The software is based on a main menu (Proxy Setup) that allows you to consider all the parameters for a particular feature (e.g., Internet access, DHCP Server addressing, and Virtual Server mappings). These features, along with others are discussed in detail in the ProxyServer Configuration section later in this chapter.

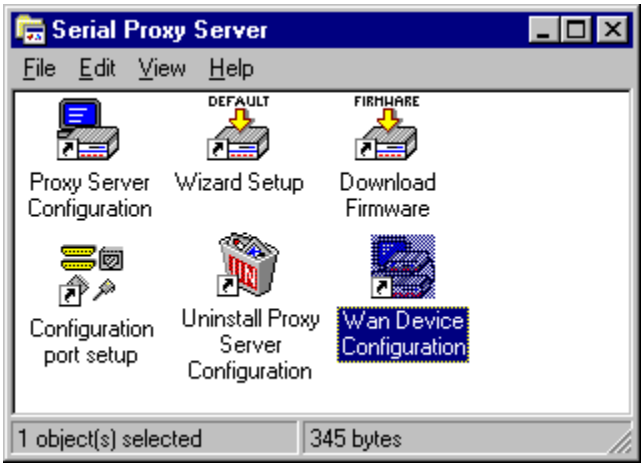
The other five configuration utilities offer additional functionality. *Wizard Setup* guides you through the initial configuration and software downloading, as described in Chapter 3. *Download Firmware* allows you to download new versions of firmware when enhancements become available. The *Configuration Port Setup* utility allows you to change the method by which you access the ProxyServer (i.e., direct connection of a PC to the Command Port on the ProxyServer, or via your Internet connection to the LAN port on the ProxyServer). The *Uninstall Proxy Server Configuration* utility is designed to remove the software from your PC. The *WAN Device Configuration* utility will open the Print Console, a terminal emulation program that will enable you to configure any external devices connected to the WAN ports.

Note: The WAN Device Configuration utility is only supported if you are directly connected to the ProxyServer. This Utility is not supported when accessing the ProxyServer via the network.

Your ProxyServer software includes the ProxyServer Help system. The Help is designed to be context sensitive, and clicking the Help button within a given dialog will provide definitions and recommended values for each button, option, and field for that dialog. In some instances, you will also be presented with a list of related topics (that can be displayed by clicking on the green, underlined text), as changes in one dialog may sometimes affect another. In addition, you can search the entire Help system (via the Index tab) for definitions and references to specific terms, fields, and recommend values where applicable.

Before You Begin

The ProxyServer software operates in a Microsoft Windows® environment. Your Serial Proxy Server program group contains all of the utilities described above, and is accessible in Windows by clicking **Start | Programs | Serial Proxy Server | *(utility)***, or by double clicking on the utility icon in the program group in My Computer. The program group is shown here:



Proxy Setup

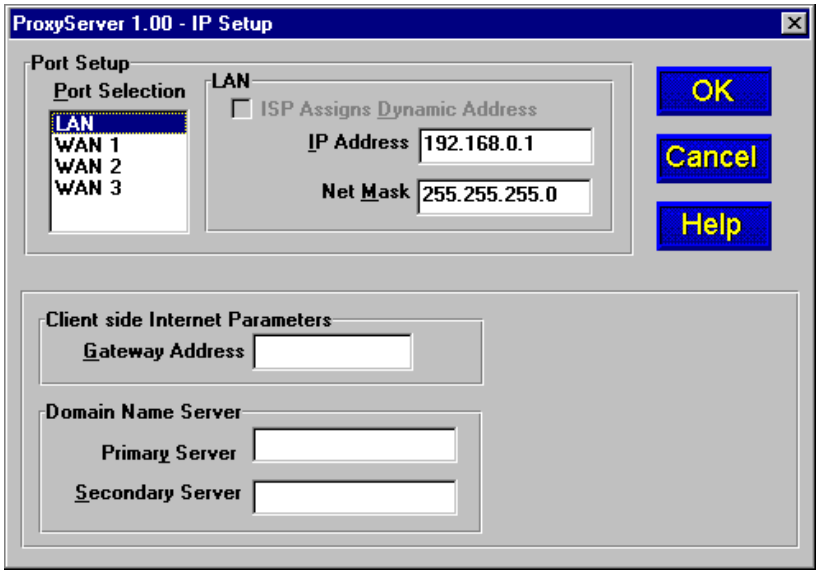
The Proxy Setup menu consists of 13 buttons, ten of which allow you to display and change the IP protocol, define the WAN ports, change features such as the Internet, DHCP server, ProxyServer, and Virtual servers, display Statistics on the WAN ports, test the communications link, print messages received from the target ProxyServer, and download setup information to the ProxyServer.

Note: The **Other** button is not supported on the MTPSR3-100, and the **Built In Test**, and **Print Console** buttons, shown as active in the screen below, are only active when the ProxyServer is directly connected to the PC. When connecting via the LAN, these options will be inactive (grayed out).

In the bottom row, there are two buttons to open the online Help system (Help) and end a Proxy Setup session (Exit).

Changing IP Parameters

The IP Setup dialog box establishes the IP addressing for your LAN and WAN ports. To change the IP Setup parameters that were configured during the Wizard Setup, click on the **IP** button in the **Proxy Setup** menu. The **IP Setup** dialog is displayed.



The **Port Selection** list displays the ports that are available for IP configuration. Ports include: LAN, WAN 1, WAN 2 and WAN 3. Once you have chosen a port from this list, its parameters will be displayed in the group to the right. For the LAN port you must statically assign a valid **IP Address** and subnetwork mask (**Net Mask**) to suit your network setup. Therefore, when the LAN port is highlighted in the Port Selection list, the **ISP Assigns Dynamic Address** field is disabled. Normally, on a WAN port, the ISP assigns a dynamic address when the port comes up. If this is not the case, you need to uncheck this control and statically assign a valid Internet address and net mask.

The LAN network of the ProxyServer connects to a host of clients that will go through the proxy server in order to access servers on the internetwork. The **Client Side Internet Parameters** group defines the parameters that affect the ProxyServer's ability to serve these clients.

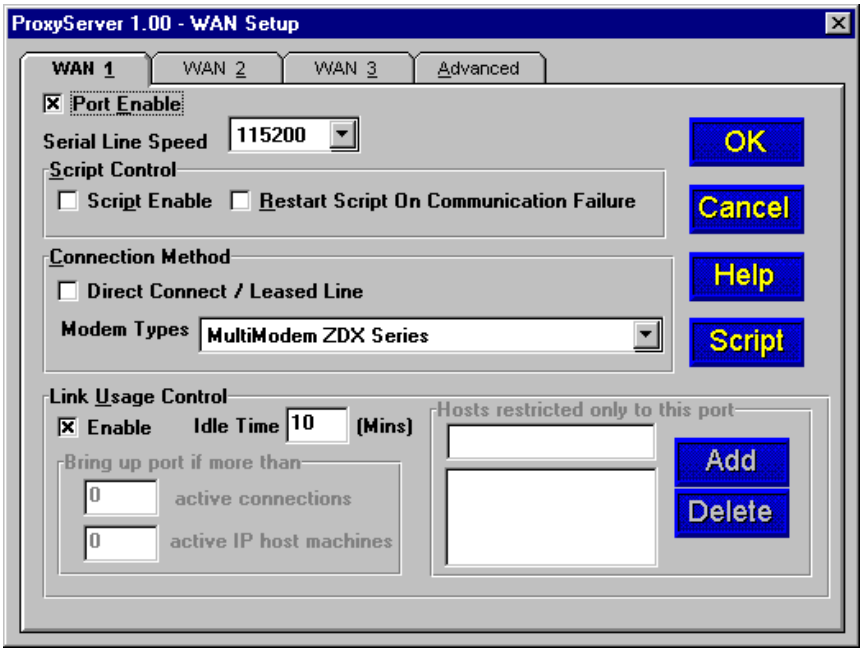
The ProxyServer supports Domain Name Server (DNS) for the terminal server application. This is a built-in Telnet client that can connect a call coming in on a WAN port from a Telnet host. When a user dials into the system to get connected to a Telnet server, the ProxyServer will prompt for a Telnet host address. The user can type in a dotted decimal IP address, or the domain name of the host.

The **Primary Server** field defines the IP address of the first host that the ProxyServer will attempt to connect to upon a user request. If this server is unavailable, the ProxyServer will attempt a connection with the Secondary Server (if defined). The **Secondary Server** field defines the IP address of the DNS server for cases where the primary server is unavailable.

Note: When the Primary and Secondary Server fields are left undefined (default), applications like terminal server will not support domain names.

Changing WAN Port Parameters

In order to change the WAN port parameters of Data Communications Equipment (DCE) devices connected to the WAN connectors on the ProxyServer, click on the **WAN** button in the **Proxy Setup** menu. The **WAN Setup** dialog box is displayed.



From this dialog, you can configure the parameters of the three WAN ports. To enable a specific WAN port, click the associated tab (WAN 1, WAN 2, or WAN 3) and click (check) the **Port Enable** check box. Once enabled, select the **Serial Line Speed**, for that port, from the drop down list.

The ProxyServer supports scripting on the WAN ports. The **Script Control** group can be used to enable scripting on the selected WAN port (**Script Enable**) and to cause scripting to restart if the WAN port is dropped and reactivated. This feature can be useful when special handling is needed on a WAN port (i.e., extra authentication, special communications equipment, etc.). The default setting for this option is disabled (unchecked). Scripting is discussed in more detail in Appendix B.

The **Connection Method** group allows you to configure the port as **Direct Connect/Leased Line**, and allows you to select the **Modem Type** for the DCE device connected to that port (see Appendix D or the online Help for more information on adding, editing and deleting modem command strings).

The **Link Usage Control** group, when enabled, causes the ProxyServer to drop the connection on the selected WAN port after a specified duration without activity (as defined in the **Idle Time** field). The default setting is enabled (checked). If you do not wish to use this option, click to disable (uncheck) it.

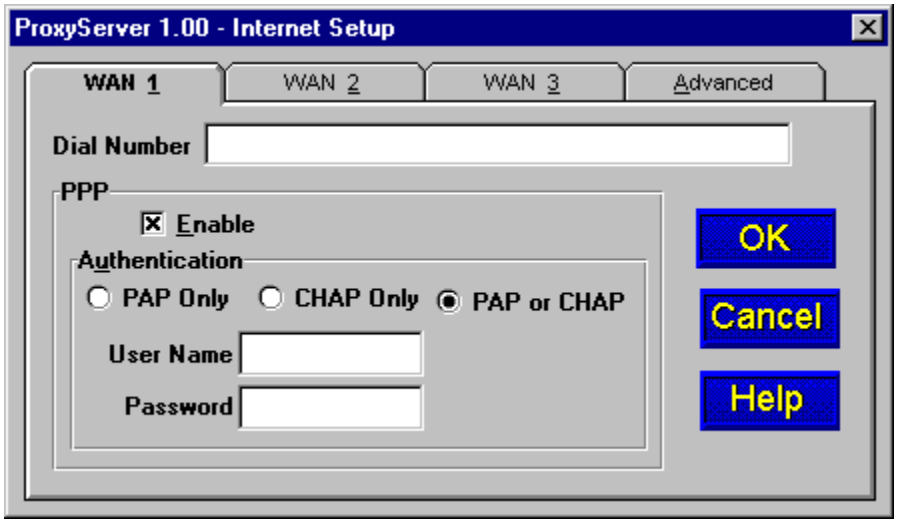
The **Bring Up Port if More Than** group allows you to configure WAN ports 2 and 3 to become active based on the traffic detected. You can configure this based on **Active Connections** or **Active IP Host Machines**. This group is not applicable to WAN 1, and is therefore inactive (grayed out) when the WAN 1 tab is selected.

The ProxyServer can be configured to limit certain workstations, based on IP addresses, to the selected port using the **Hosts Restricted Only to This Port** group. The first of the two fields in this group defines the IP address of the workstation to be restricted. To add a new restriction, enter a valid IP address of a workstation in this field, and click **Add**. The new entry will appear in the list of restrictions below. This group is not applicable to WAN 1, and is therefore inactive (grayed out) when the WAN 1 tab is selected.

Changing Internet Parameters

The Internet Setup dialog box is used to establish the Internet options for the WAN ports. Parameters for individual ports are configured through their respective tabs (i.e., WAN 1, WAN 2 or WAN 3). The Advanced tab allows you to configure various general parameters for a Point-to-Point Protocol (PPP).

To change the Internet parameters click on the **Internet** button in the **Proxy Setup** menu. The **Internet Setup** dialog is displayed.

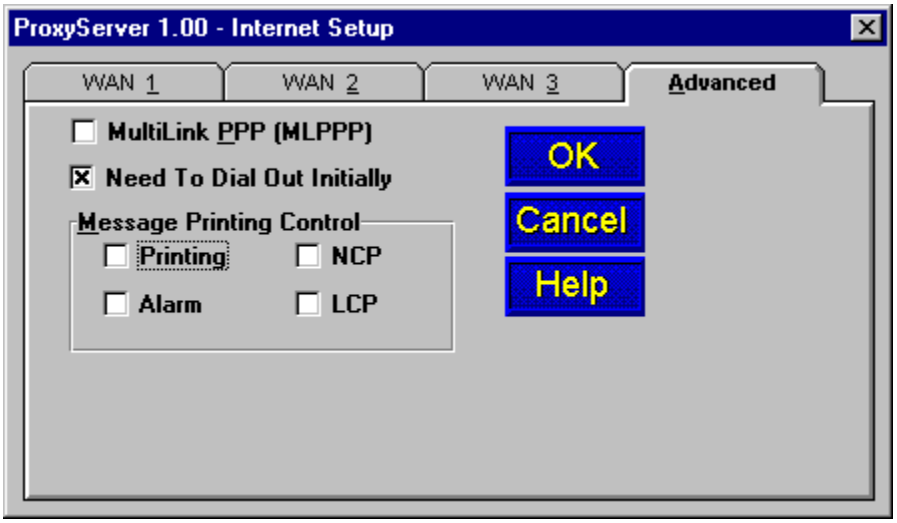


If the selected WAN port is configured as Dialing, enter the phone number of the peer end in the **Dial Number** field.

ProxyServer supports Point-to-Point Protocol (PPP) on its WAN links. The default setting for this option is enabled (checked). If you are not planning to use this option, you must click this option to disable (uncheck) it.

ProxyServer supports the use of two user authentication protocols on PPP connections. One is the Password Authentication Protocol (PAP) and the other is the Challenge Handshake Authentication Protocol (CHAP). To force the use of either one of these protocols, select the desired option. To enable the ProxyServer to negotiate the use of a suitable protocol with the remote router or remote access server software, click **PAP or CHAP**.

Clicking the **Advanced** tab brings up the parameters that affect all of the WAN links.



The ProxyServer is capable of performing MultiLink Point-to-Point Protocol (MLPPP). MLPPP provides the opportunity for greater bandwidth by bundling WAN port links. Check **MultiLink PPP (MLPPP)** to enable this option if your ISP provides this support.

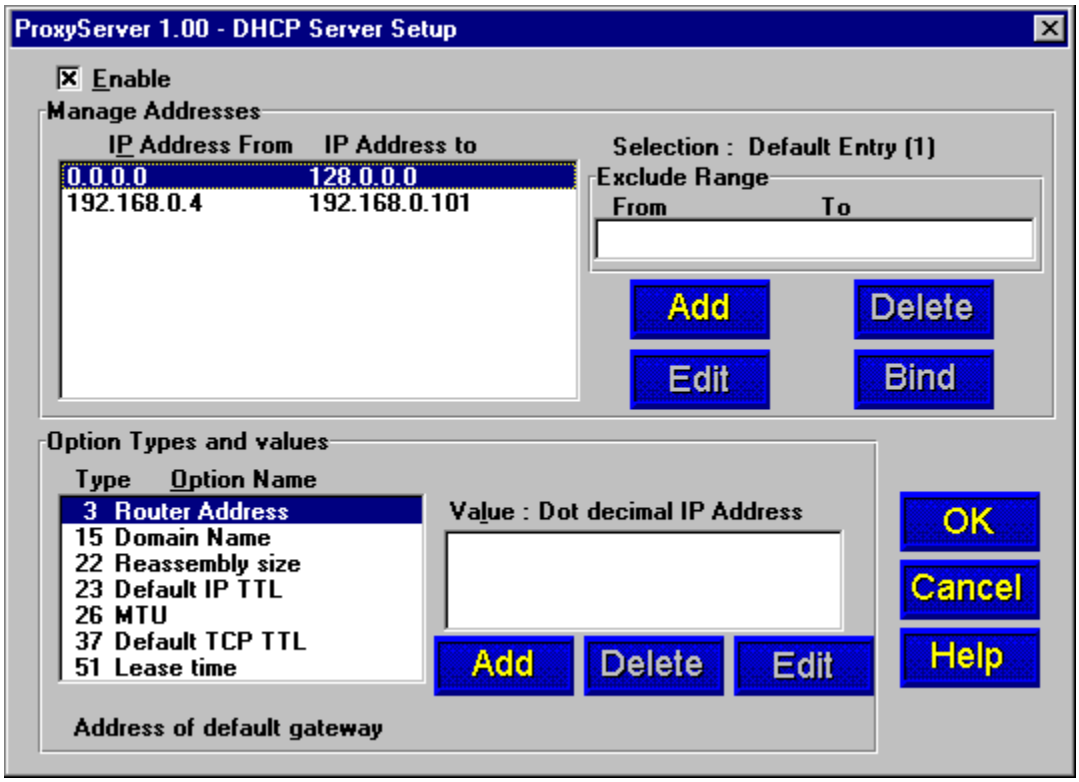
Note: In order for link bundling to take place, you need to make sure that the User Name and Password of all the WAN port links are the same. Verify and or/change using the individual WAN tabs.

If the **Need to Dial Out Initially** option is enabled (default) the ProxyServer will dial up on the WAN link(s) upon start up. If this option is disabled, then the ProxyServer will wait to dial until the first dial request has been made.

The **Message Printing Control** group is used to flag specific items for generating messages on various conditions, including Printing, Alarm, NCP (NetWare Core Protocol), and LCP (Link Control Protocol) messages. These messages can be useful as troubleshooting tools, however, it is recommended that under normal circumstances, all items should be disabled to avoid degradation of ProxyServer performance.

Enabling the DHCP Server

The DHCP Server feature manages all IP address assignments within a workgroup, and is enabled in the DHCP Server Setup dialog box. To enable the DHCP Server, click on the **DHCP Server** button in the **Proxy Setup** menu. The **DCHP Server Setup** dialog box appears.



Click **Enable** to enable the ProxyServer's built in DHCP server.

The **Manage Addresses** group defines the IP address range and those addresses that may be excluded in the Exclude Range. This means you can establish a range of client addresses and then exclude specific addresses from that range in the **Exclude Range** field. You can also add, delete, edit and bind addresses using the corresponding buttons in this group.

The **Option Types and Values** group on the bottom portion of the menu allows you to customize the configuration of the client platform. Again, you can add, delete and edit an option by highlighting it and clicking on the appropriate button. You cannot, however, edit or delete entries provided in the default list.

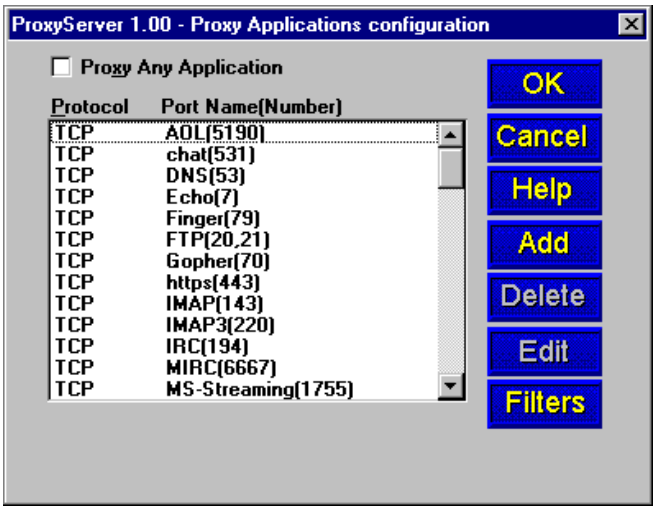
Refer to the online Help for definitions of individual fields and buttons.

Adding Proxy Applications

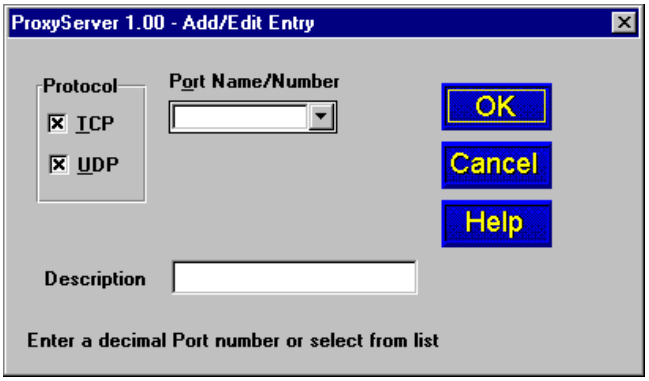
Certain software on your LAN may require a TCP or UDP port usage that is not currently supported by the ProxyServer. If this is the case, you will need to add the port usage using the Proxy Applications Configuration dialog. If you want more information about application configuration refer to RFC 1700 (http://www.cis.ohio-state.edu/htbin/rfc/rfc1700.html) which defines the Internet Protocol suite. RFC 1700 identifies parameters such as Internet address, domain names, autonomous system numbers, protocol numbers, port numbers, and many others. Once the necessary information has been determined, you can add the application(s) to the supported list. Without this information, the ProxyServer will not allow packets through to the Internet from the unknown software.

The default list of protocols includes many of the most common port usages, however, not all are included because an increase in the number of port usages supported means a *possible* decrease in performance speed, and an increased security risk.

If you wish to add ProxyServer applications that are not currently supported, click on the **Proxy Server** button in the **Proxy Setup** menu. The **Proxy Applications Configuration** dialog box appears. This menu includes a list of all the applications currently supported by the ProxyServer.



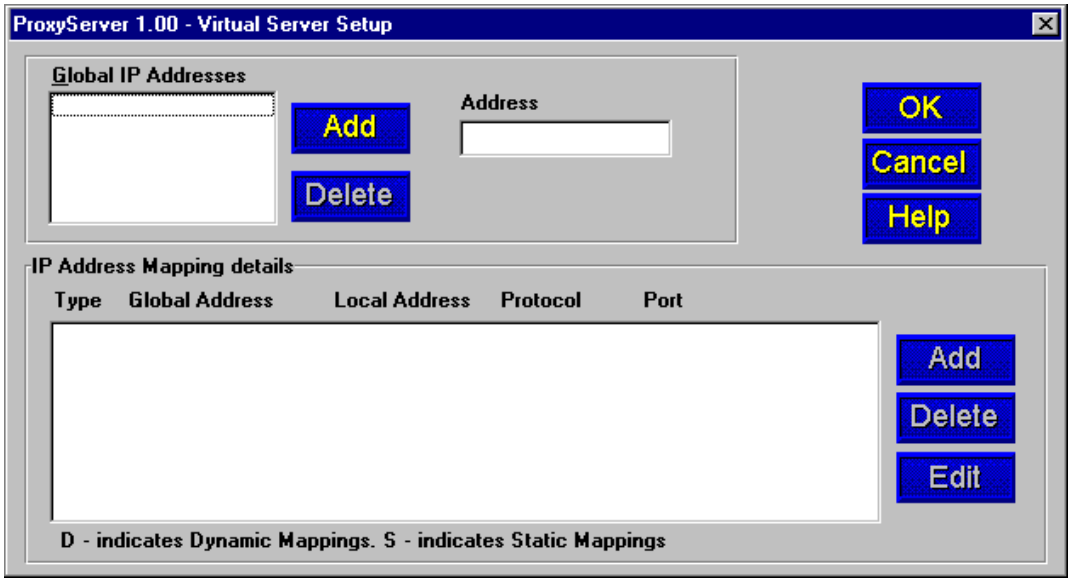
Click on the **Add** button. The **Add/Edit Entry** dialog box appears.



This dialog will allow you choose the desired protocol and enter a **Port Name/Number** and **Description**. After you have entered these items, click on **OK** to add the port usage to the list of supported usages.

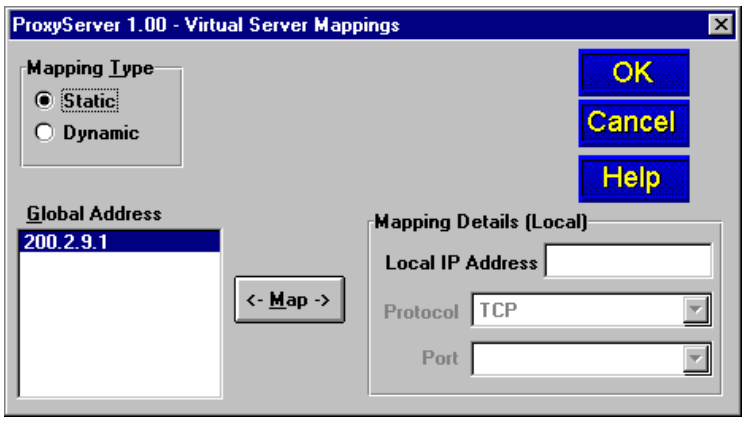
Enabling the Virtual Server

The Virtual Server Setup dialog box allows you to assign a virtual address to a statically assigned server. For example, if the ISP assigns static address of 200.2.9.1, you can set up a virtual server so that any requests sent to 200.2.9.1 will access 192.168.0.102. To configure virtual servers, click on the **Virtual Servers** button in the **Proxy Setup** menu.



To add a Virtual Server, type a valid IP address in the Address field and then click on the Add button in the Global IP Addresses group. The new address appears in the Global IP Addresses list.

Click on the **Add** button in the **IP Address Mapping details** group. The **Virtual Server Mappings** dialog box appears.



In the Mapping Type group, click on either Static or Dynamic. This will determine whether the Global IP Address is mapped to only one local IP address or mapped to a number of unique triplets (i.e., local address, protocol, and port).

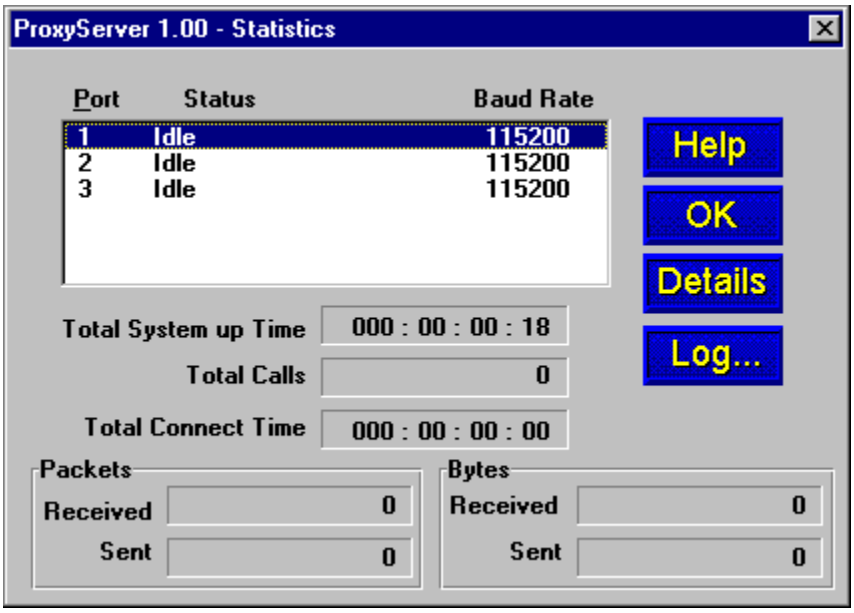
If the **Mapping Type** is **Static**, then enter the **Local IP Address** that the Global Address will be mapped to in the **Local IP Address** field, and click on the **Map** button.

If the **Mapping Type** is **Dynamic**, then enter a **Local IP Address**, **Protocol** and **Port** in the appropriate fields and click on **Map**.

The new mapping will be displayed in the **IP Address Mapping details** group list.

Viewing Statistics

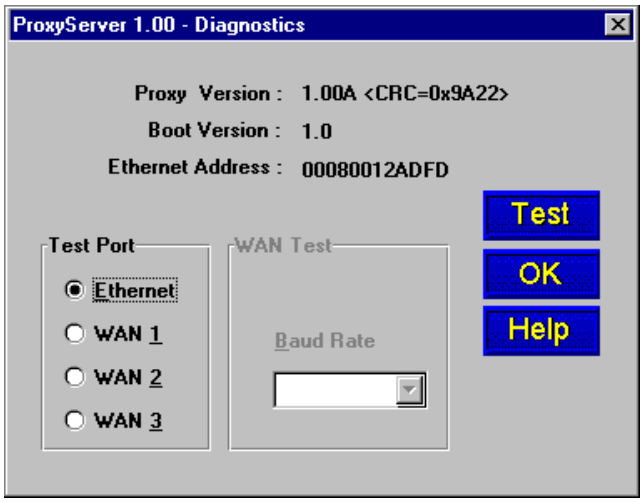
The ProxyServer is capable of providing statistics for each port and for the whole system. These statistics can be useful for troubleshooting and management purposes. To access this information, click **Statistics** in the **Proxy Setup** menu. The **Statistics** dialog is displayed.



From this menu, you can observe total system statistics such as Total Up Time, and Total Calls. In addition, you can view the real-time statistics of a specific port by selecting that port from the list and clicking **Details**, or click **Log...** to save current statistics to a log file for future use (i.e., troubleshooting, management).

Running Diagnostics

Proxy Setup lets you perform various hardware tests on the LAN and WAN links. The **Diagnostics** dialog box is displayed by clicking on the **Built in Test** button in the **Proxy Setup** dialog box. Diagnostic tests are performed if the Communication type of the Local Port configuration is set to COM Port. If the Local Port configuration is set for IP, no diagnostic tests are performed by the ProxyServer.



ProxyServer
Internet Access Server

Chapter 5 - Client Setup

MultiTech Systems

Introduction

The information provided in this chapter enables multiple users to configure their Windows® PCs to access the Internet through a ProxyServer. The procedures are divided into two sections, based on operating platform. The first section covers configuration of Windows 95/98 PCs, and the second section covers configuration of Windows NT (4.0 Workstation) PCs.

Before you Begin

Before you begin the client setup process, read through the following requirements:

ProxyServer

The ProxyServer was configured by the administrator who, while installing the software, determined that the ProxyServer would either automatically assign Internet (IP) addresses, or require that they be assigned manually to each client PC. Also, the administrator assigned an IP address to the ProxyServer's Ethernet port, and assigned user names and passwords to the WAN links. All these factors play a role in client configuration and you should be aware of the decisions made prior to setting up client PCs.

PC

To access the ProxyServer, your PC must have communications capability including hardware, such as a network card, and any necessary software.

If the ProxyServer does not automatically assign an IP address to each PC, you will have to obtain it from your network administrator. You will also need the IP address for the ProxyServer (the Gateway address), and the IP Address of your organization's Domain Name Server (DNS). All these items are needed so your PC can identify the ProxyServer as its gateway and properly set up your network security.

Checklist

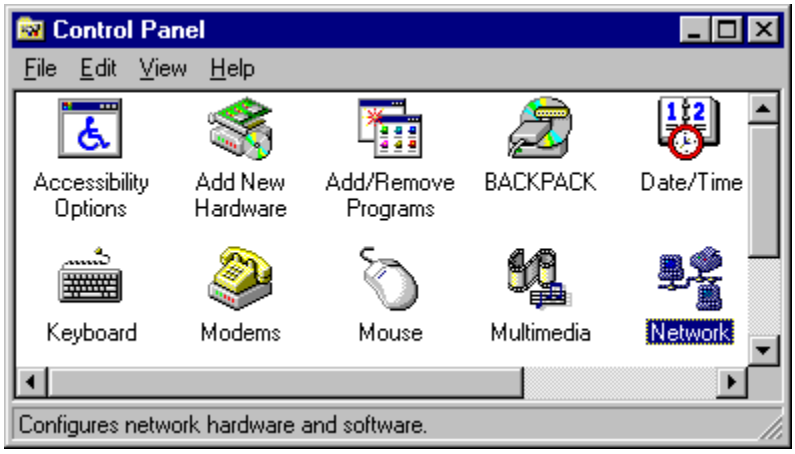
A checklist has been provided towards the end of each procedure (Step 16 for Win95/98, Step 20 for WinNT). This checklist is included in the setup so that you can record all the pertinent information required for the connection between your PC and the ProxyServer. Keep this as a reference for future upgrades.

Configuring in Windows 95/98

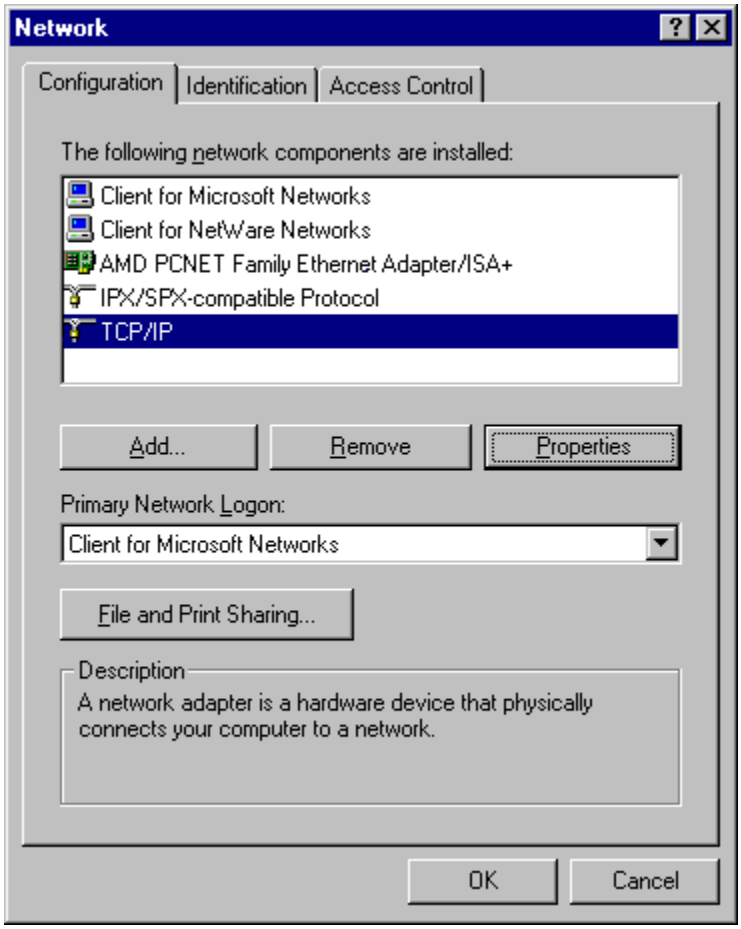
Perform the following steps to set up your Windows 95/98 PC:

Note: All of the hardware and screens used in this section are intended as examples only. Please select options appropriate to your system.

1 Click **Start | Settings | Control Panel** and then double click on the **Network** icon.

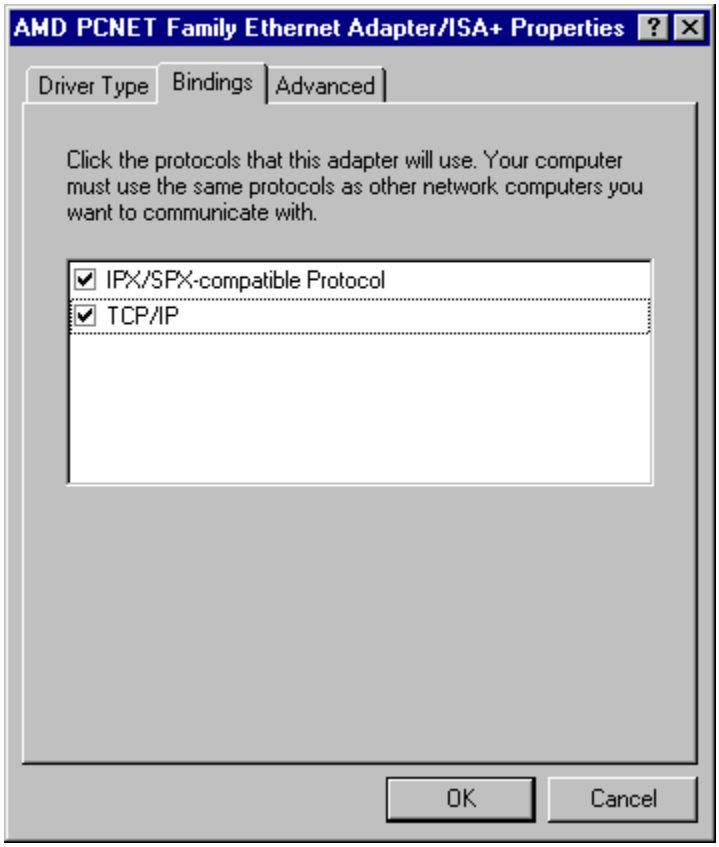


The **Network** dialog appears displaying the **Configuration** tab, which shows all the components (i.e., clients, adapters, protocols, and any services) installed on your PC.



2 If **TCP/IP** is listed, proceed to step 3; otherwise, refer to **Installing TCP/IP (Win95/98)**, at the end of this section.

3 Check for binding between the adapter and TCP/IP. In the **Network** dialog, click on your Ethernet adapter to select it, then click **Properties** to display the Adapter Properties window.

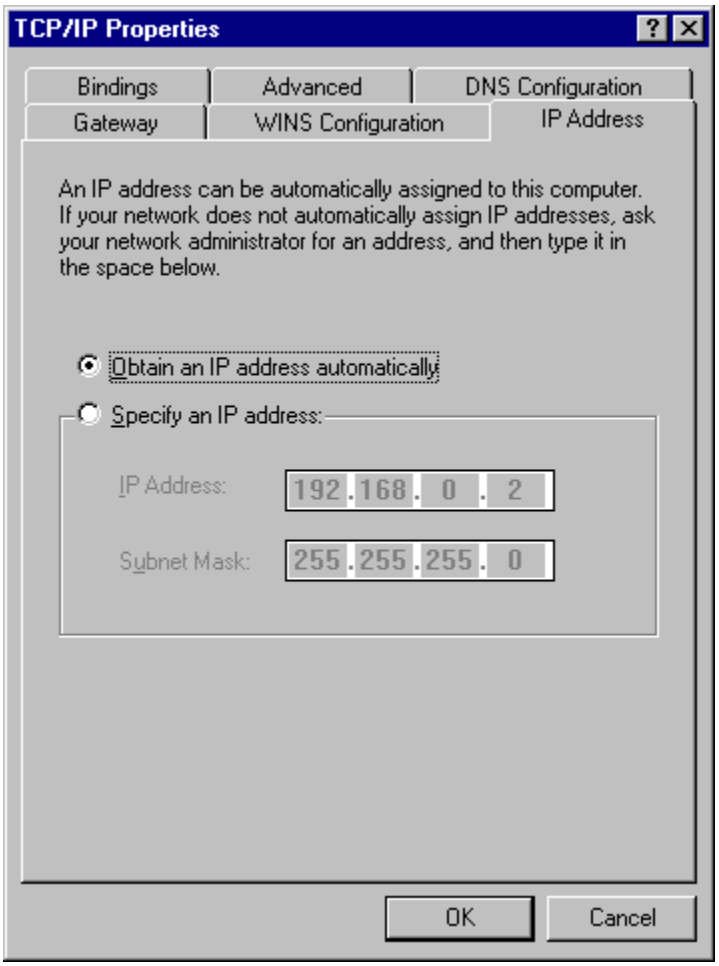

AMD PCNET Family Ethernet Adapter/ISA+ Properties
Driver Type
Bindings
Advanced
Click the protocols that this adapter will use. Your computer must use the same protocols as other network computers you want to communicate with.
IPX/SPX-compatible Protocol
TCP/IP
OK
Cancel

4 Click the **Bindings** tab, then if necessary click on the box to the left of TCP/IP so this entry is enabled (checked).

Note: There may be other protocols listed and enabled under your Ethernet adapter. This does not affect the TCP/IP protocol. Rather, it simply means your computer will accept messages using those protocols as well as TCP/IP.

Click **OK** to return to the **Network** dialog.

5 Select **TCP/IP**, then click **Properties** to open the **TCP/IP Properties** window.



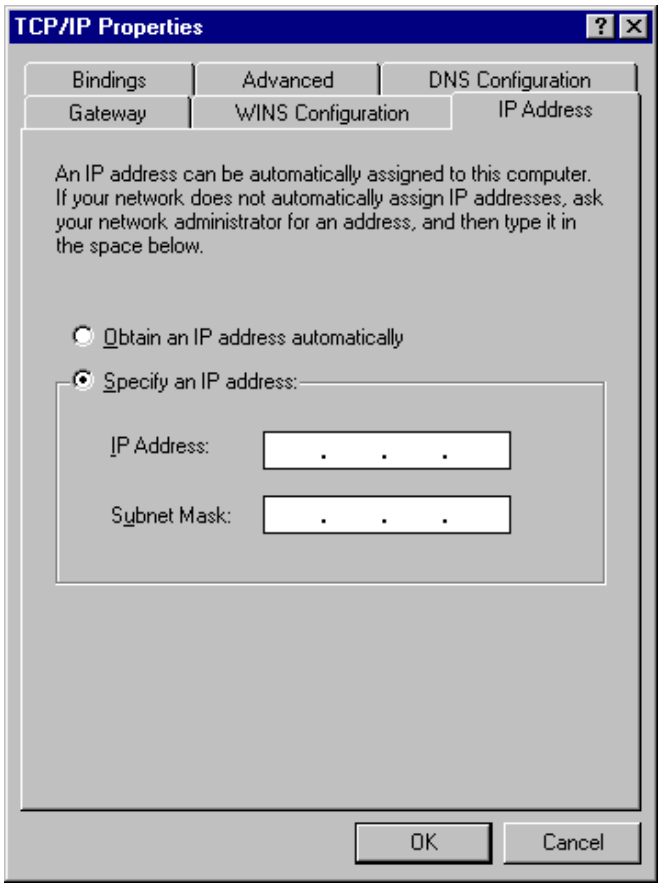
6 Select the **IP Address** tab.

The IP addressing method depends on how your ProxyServer's DHCP Server option was configured. If DHCP Server is active, your IP address is issued automatically. If your network administrator did NOT activate DHCP Services on the ProxyServer, you will have to assign your IP address manually.

Verify the ProxyServer/DHCP status with your network administrator, then proceed to step 7 for DHCP assigned addressing, or to step 8 for manual addressing.

7 If DHCP Services are active on the ProxyServer (default), verify that the **Obtain an IP address automatically** option is selected. You are done; go to step 17 to reboot your PC and attempt to open an Internet session.

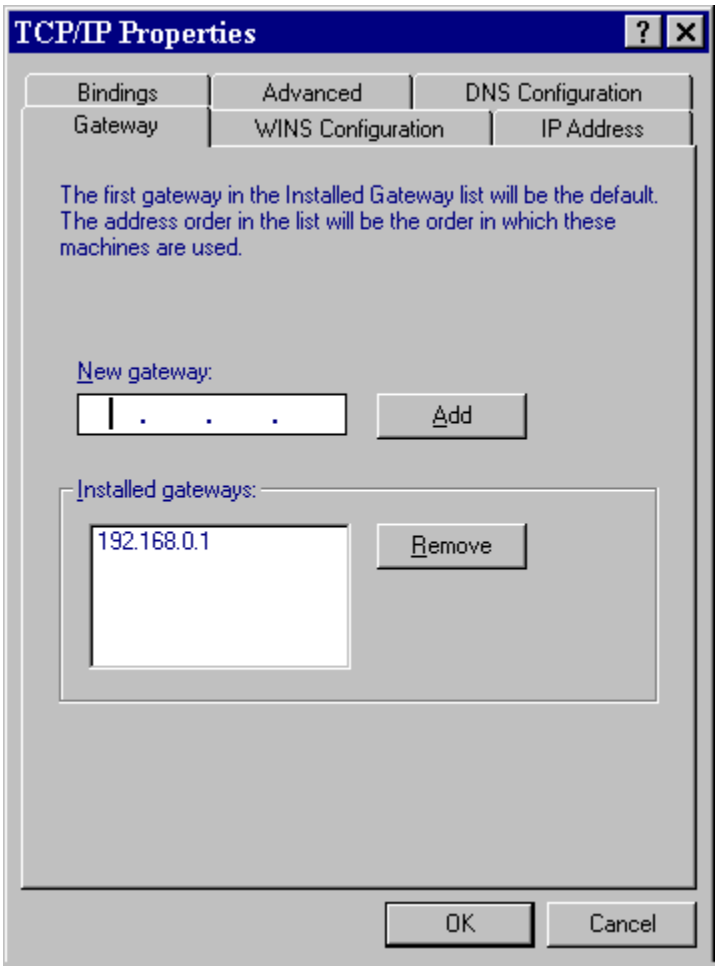
8 If DHCP Services are NOT active on the ProxyServer, you will have to manually enter your IP address. Select manual addressing by clicking the **Specify an IP address** option. The IP Address and Subnet Mask fields become active.


TCP/IP Properties
Bindings
Advanced
DNS Configuration
Gateway
WINS Configuration
IP Address
An IP address can be automatically assigned to this computer. If your network does not automatically assign IP addresses, ask your network administrator for an address, and then type it in the space below.
Obtain an IP address automatically
Specify an IP address:
IP Address:
Subnet Mask:
OK
Cancel

9 In the **IP Address** field, type the IP address assigned to your PC.

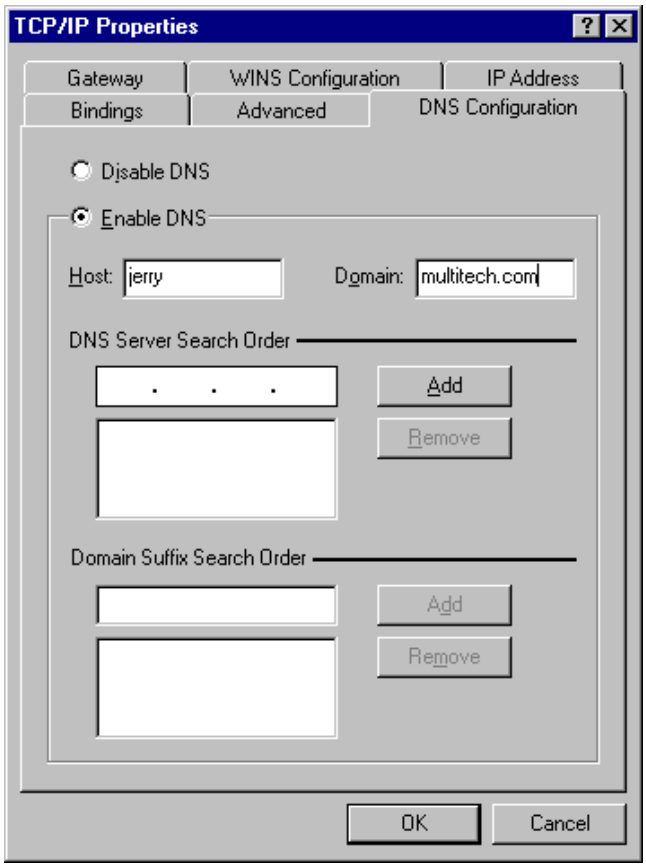
Remove the default IP address (if any), and begin typing the new address. This address is entered in dotted decimal notation, and is comprised of four groups (octets) separated by periods or “dots.” If a group has fewer than 3 digits, type the necessary digits an press the space bar to move to the next group. When you are finished, verify that the IP address is *identical* to the IP address you were given for your PC.

10 Click on the **Gateway** tab.



11 In the **New gateway** field, enter the IP address of the ProxyServer's Ethernet port and click **Add**. The new gateway address appears in the list of **Installed gateways**.

12 Click on the **DNS Configuration** tab. Verify that **Enable DNS** is selected (checked).



13 In the **Host** field, enter your user name (i.e., jerry).

14 In the **Domain** field, enter your company's domain name (usually the company name followed by one of the following extensions: .com, .edu, .gov, .org, .mil, or .net. For example, multitech.com).

15 In the **DNS Server Search Order** group, place the cursor in the first group of the address field and type the IP address of your LAN's DNS server (provided by your network administrator). Click **Add** and the new address appears in the list below the address field.

Your network may have more than one DNS server, allowing you to use a secondary DNS server if the primary DNS server is not available. If this is the case, add the IP address of the secondary DNS server using the same procedure as with the first.

Note: The address that appears first (at the top) of the list is the primary server (the first one searched). You can "drag and drop" the items in the list, if necessary, until the primary DNS server is listed first.

When this is done, click **OK**. You are returned to the **Network** dialog.

16 In the Network dialog, Click **OK**. You are returned to the **Control Panel**.

Use the following checklist to record all the configuration settings for future use:

Configuration Checklist	
IP Address (PC)	. . .
IP Address (ProxyServer)	. . .
Host (User Name)	
Domain	
DNS Server Address	. . .
Network Adapter (Manufacturer/Model Number)	

17 Reboot the PC for changes to take effect.

At this point your client setup is complete. Test your setup by following steps 18 and 19. If you encounter problems, contact you administrator.

18 Initiate an Internet session by double-clicking on your browser icon, or try to FTP a file.

Note: The ProxyServer operates transparently, so there should not be a need for any special proxy settings on your IP applications (i.e., browser, Telnet, or FTP). Set up each application as “No Proxy” or equivalent.

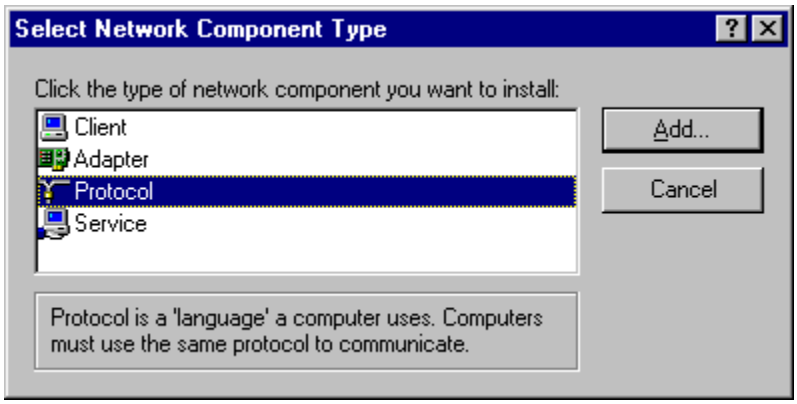
19 To further validate your connection to the ProxyServer, “Ping” the IP address of the ProxyServer.

Installing TCP/IP (Win95/98)

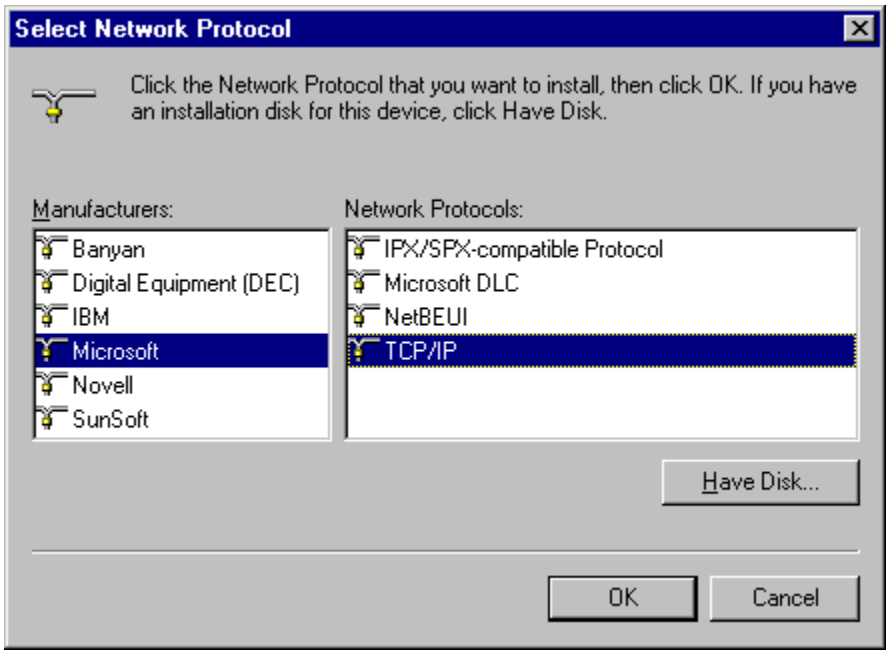
If TCP/IP is not already installed, perform the following steps:

Note: For this procedure you may need your Windows installation disks or CD ROM.

1 In the **Network** dialog, click **Add**. The **Select Network Component Type** dialog is displayed with a list of installation options.



2 Select **Protocol** and click **Add**. The **Select Network Protocol** dialog is displayed with protocol options.



3 In the **Manufacturers** list click on the manufacturer option (Microsoft in the example) to highlight it. A list of available protocols will appear in the **Network Protocols** list.

4 In the **Network Protocols** list, select **TCP/IP** and click **OK**.

5 Exit the add option. Click on the **OK** button.

Note: If Windows does not find the necessary files on the hard drive, click **Have Disk** and follow the on-screen instructions for loading TCP/IP from the installation disks/CD-ROM.

6 Reboot your PC for changes to take effect.

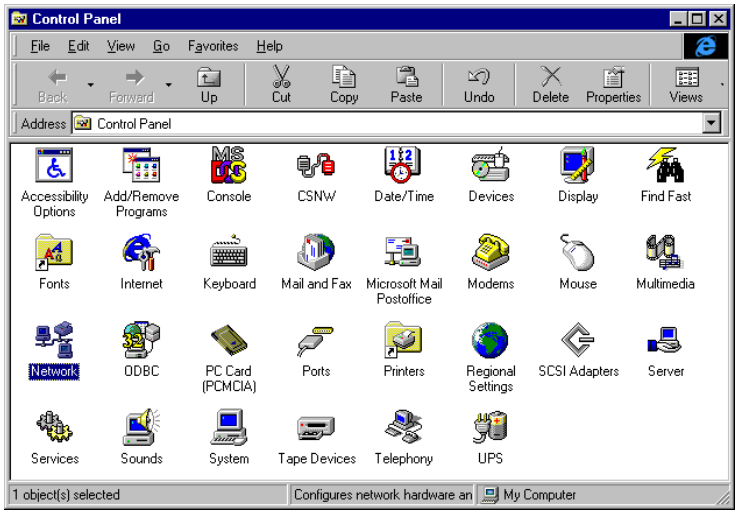
7 Click **Start | Settings | Control Panel** and double-click on the **Network** icon to return to the Network dialog. Return to step 3 of the **Configuring in Windows 95/98** and continue with the client setup procedure.

Configuring in Windows NT

Perform the following steps to set up your Windows NT workstation PC:

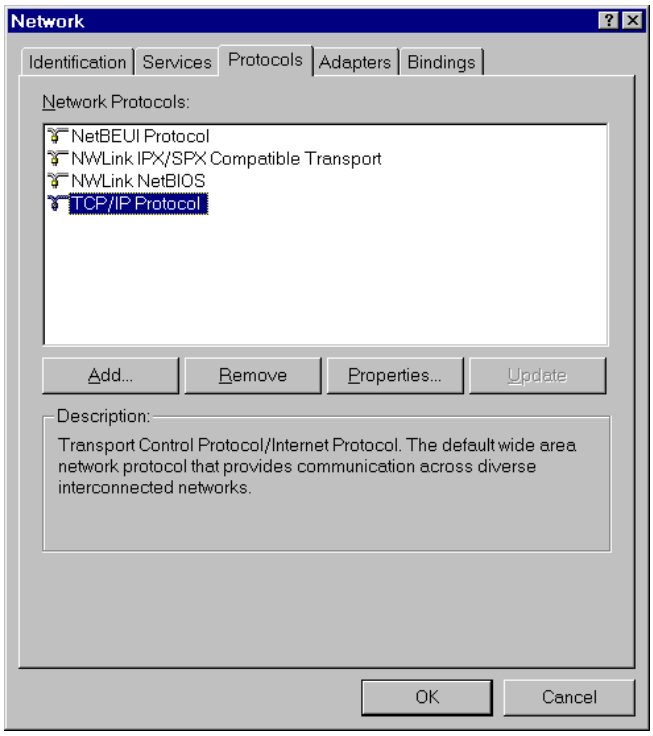
Note: All of the hardware and screen samples in this section are intended as examples only. Please select options appropriate to your network.

1 Click **Start | Settings | Control Panel** and then double click on the **Network** icon.



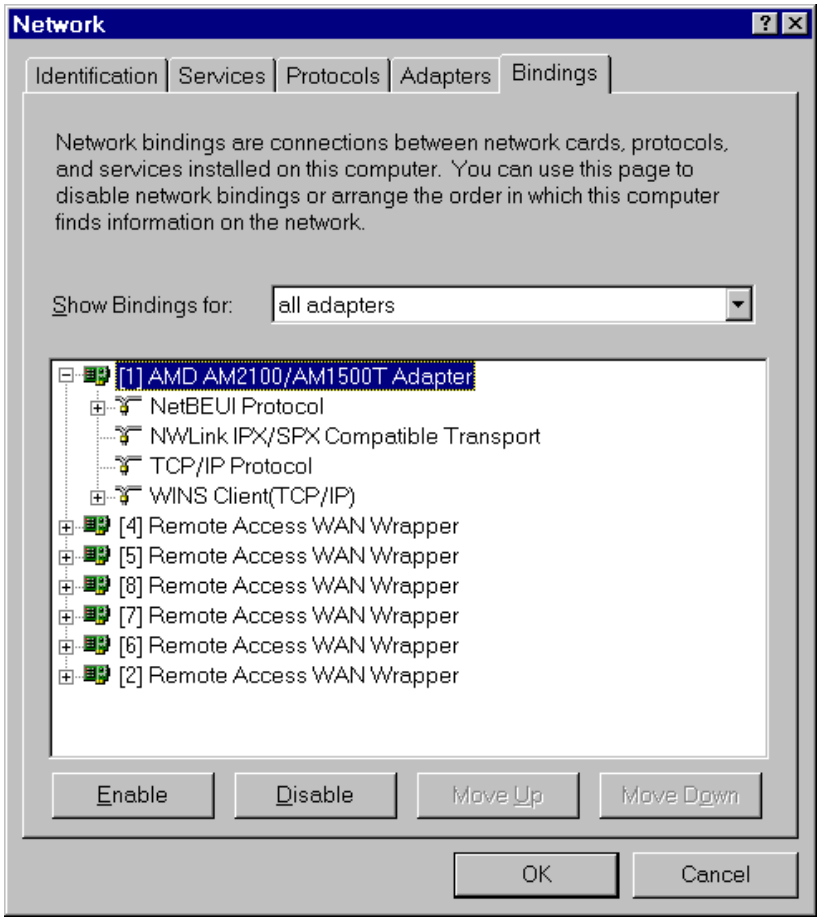
The **Network** dialog appears.

2 Click on the **Protocols** tab.



3 A list of protocols currently present on your PC is displayed. Check the installed protocols. If you find **TCP/IP Protocol** listed, proceed to step 4. If TCP/IP is not listed, you must install it prior to proceeding. Refer to **Installing TCP/IP (WinNT)**, at the end of this section.

4 Click on the **Bindings** tab.



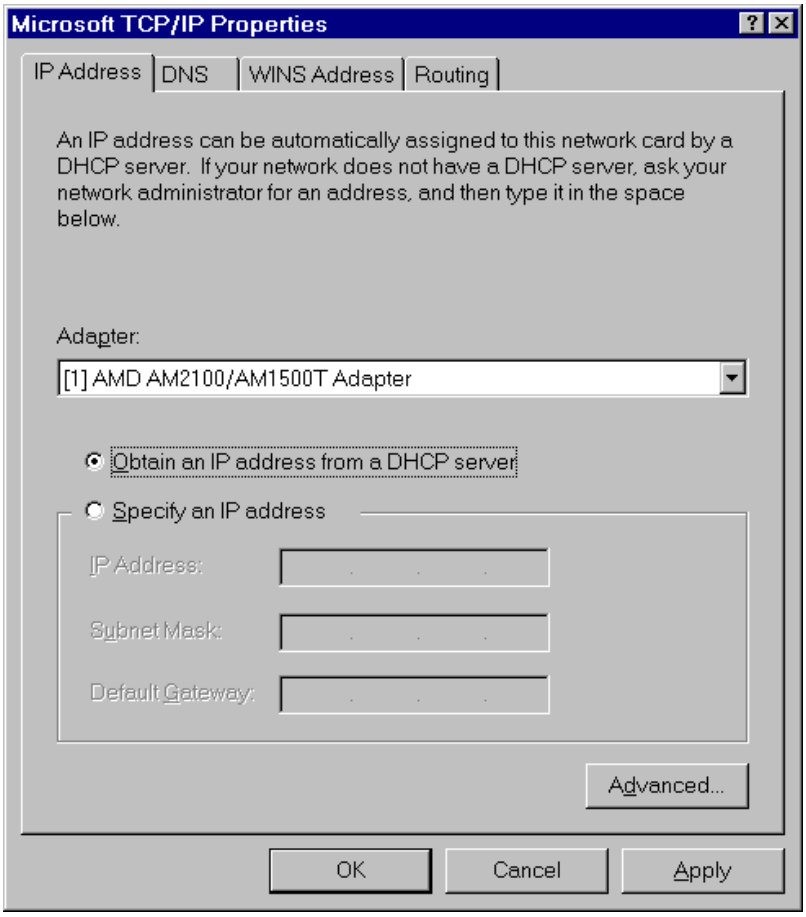
5 In the **Show Bindings for** drop down list, select **all adapters**. A list of all adapters is displayed.

6 Double click on the entry for your Ethernet card adapter to expand the list of bindings. Verify that **TCP/IP Protocol** is included in the bindings below your adapter.

Note: There may be other protocols in the list under your Ethernet adapter. This does not affect the TCP/IP protocol. Rather, it simply means your computer will accept messages using those protocols as well as TCP/IP.

7 Click on the **Protocols** tab.

8 In the **Network Protocols** list select **TCP/IP**, then click **Properties**. The **Microsoft TCP/IP Properties** dialog is displayed.


Microsoft TCP/IP Properties
IP Address
DNS
WINS Address
Routing
An IP address can be automatically assigned to this network card by a DHCP server. If your network does not have a DHCP server, ask your network administrator for an address, and then type it in the space below.
Adapter:
[1] AMD AM2100/AM1500T Adapter
Obtain an IP address from a DHCP server
Specify an IP address
IP Address:
Subnet Mask:
Default Gateway:
Advanced...
OK
Cancel
Apply

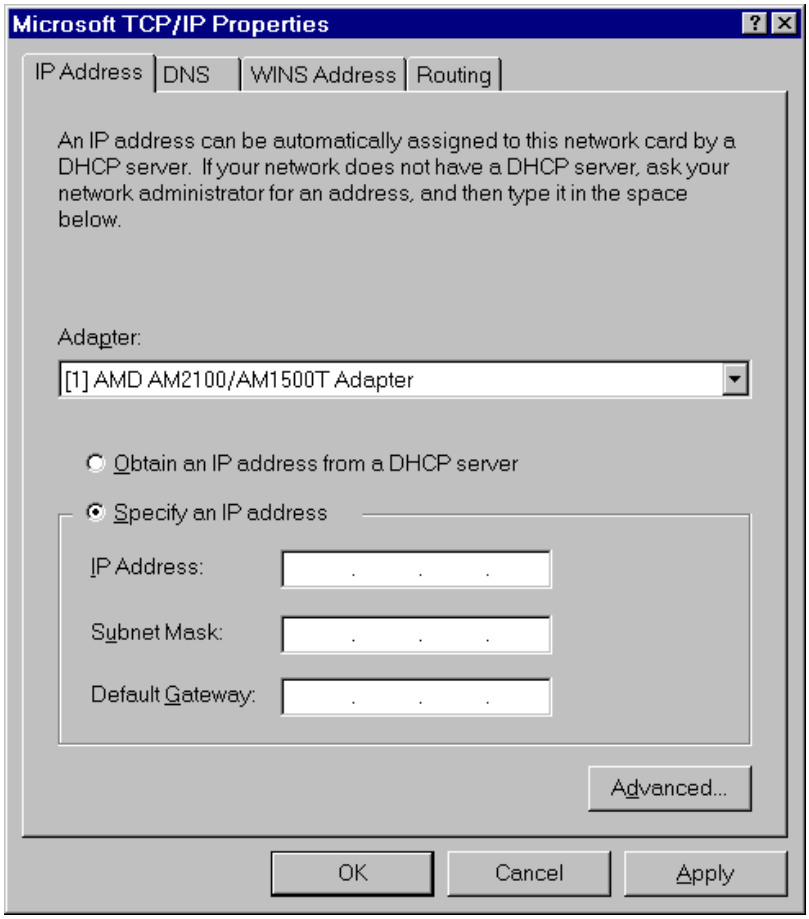
9 Click on the **IP Address** tab.

The IP addressing method depends on how your ProxyServer's DHCP Server option was configured. If DHCP Server is active, your IP address is issued automatically. If your network administrator did NOT activate DHCP Services on the ProxyServer, you will have to assign your IP address manually.

Verify the ProxyServer/DHCP status with your network administrator, then proceed to step 10 for DHCP assigned addressing, or to step 11 for manual addressing.

10 If DHCP Services are active on the ProxyServer (the default), verify that the **Obtain an IP address from a DHCP server** option is enabled (checked). At this point, you are done. Go to step 21 and attempt to open an Internet session.

11 If DHCP Services are NOT active on the ProxyServer, you will have to manually enter your IP address. Select manual addressing by clicking the **Specify An IP Address** option. The IP Address and Subnet Mask fields become active.


Microsoft TCP/IP Properties
IP Address
DNS
WINS Address
Routing
An IP address can be automatically assigned to this network card by a DHCP server. If your network does not have a DHCP server, ask your network administrator for an address, and then type it in the space below.
Adapter:
[1] AMD AM2100/AM1500T Adapter
Obtain an IP address from a DHCP server
Specify an IP address
IP Address:
Subnet Mask:
Default Gateway:
Advanced...
OK
Cancel
Apply

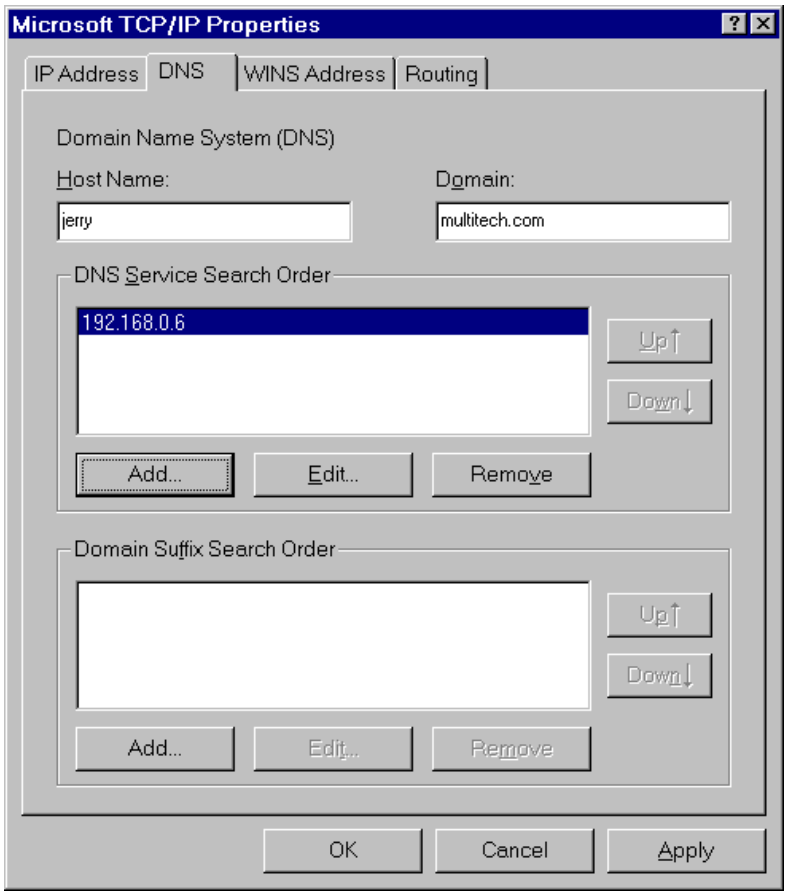
12 In the **IP Address** field, type the IP address assigned to your PC.

Remove the default IP address (if any), and begin typing the new address. This address is entered in dotted decimal notation, and is comprised of four groups (octets) separated by periods or “dots.” If a group has fewer than 3 digits, type the necessary digits an press the space bar to move to the next group. When you are finished, verify that the IP address is *identical* to the IP address you were given for your PC.

13 In the **Subnet Mask** field, type the subnetwork mask assigned by your administrator. When you are finished, verify the new mask.

14 In the Default Gateway field, type the IP address of the gateway assigned to your LAN. When you are finished, verify the new gateway.

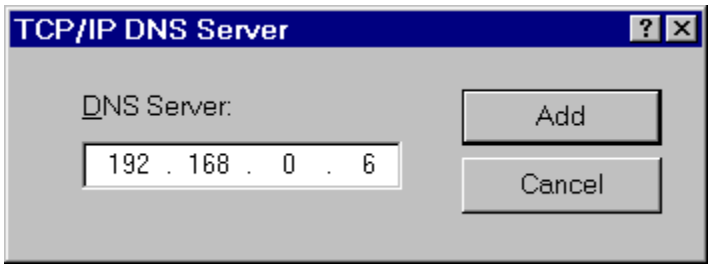
15 Click on the **DNS** tab. The **Domain Name System (DNS)** properties are displayed.



16 In the **Host Name** field, type your user name (i.e., jerry).

17 In the **Domain** field, enter your company's domain name (usually the company name followed by one of the following extensions: .com, .edu, .gov, .org, .mil, or .net. For example, multitech.com).

18 In the **DNS Server Search Order** group, click Add. The **TCP/IP DNS Server** dialog is displayed.



19 In the **DNS Server** field, place the cursor in the first group and type the IP address of your LAN's DNS server (provided by your network administrator).

20 Click **Add**. You are returned to the **Microsoft TCP/IP Properties** dialog, **DNS** tab, and the new address appears in the **DNS Search Order** list.

Your network may have more than one DNS server, allowing you to use a secondary DNS server if the primary DNS server is not available. If this is the case, add the IP address of the secondary DNS server using the same procedure as with the first.

Note: The address that appears first (at the top) of the list is the primary server (the first one searched). You can use the **Up** and **Down** buttons to rearrange the items in the list, if necessary, until the primary DNS server is listed first.

When this is done, click **OK**. You are returned to the **Network** dialog.

Use the following checklist to record all the configuration settings for future use:

Configuration Checklist	
IP Address (PC)	. . .
IP Address (ProxyServer)	. . .
Host (User Name)	
Domain	
DNS Server Address	. . .
Network Adapter (Manufacturer/Model Number)	

21 Reboot the PC for changes to take effect.

At this point your client setup is complete. Test your setup by following steps 22 and 23. If you encounter problems, contact you administrator.

22 Initiate an Internet session by double-clicking on your browser icon, or try to FTP a file.

Note: The ProxyServer operates transparently, so there should not be a need for any special proxy settings on your IP applications (i.e., browser, Telnet, or FTP). Set up each application as “No Proxy” or equivalent.

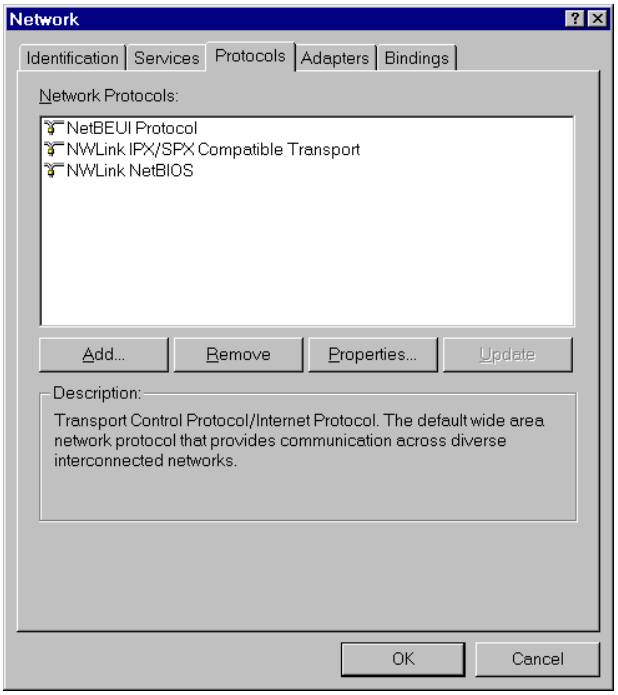
23 To further validate your connection to the ProxyServer, “Ping” the IP address of the ProxyServer.

Installing TCP/IP (WinNT)

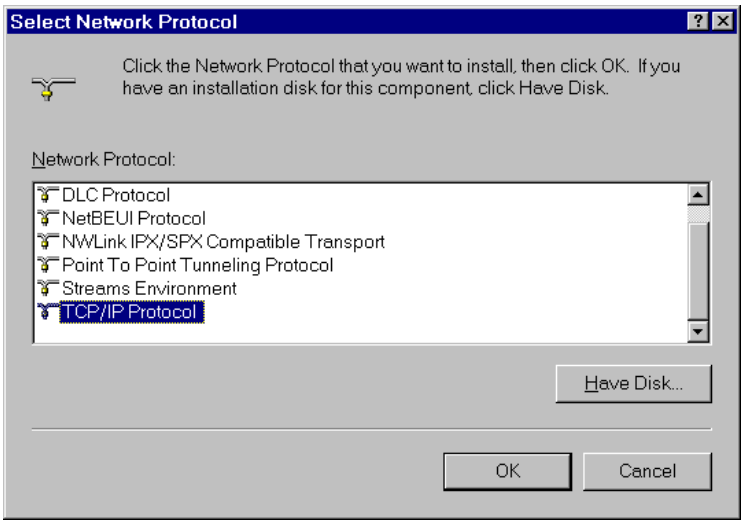
If TCP/IP is not already installed, perform the following steps:

Note: For this procedure you may need your Windows NT installation CD ROM.

1 While the **Network** dialog box is open, click **Add**.



2 The Select Network Protocol dialog is displayed with a list of available protocol options.


Select Network Protocol
Click the Network Protocol that you want to install, then click OK. If you have an installation disk for this component, click Have Disk.
Network Protocol:
DLC Protocol
NetBEUI Protocol
NWLink IPX/SPX Compatible Transport
Point To Point Tunneling Protocol
Streams Environment
TCP/IP Protocol
Have Disk...
OK
Cancel

3 Highlight **TCP/IP Protocol** and click **OK**.

If necessary (i.e., the operating system does not find the necessary files on the hard drive), click on the **Have Disk** button, then follow the instructions provided on-screen.

You are returned to the **Network** dialog.

4 Reboot your PC for changes to take effect.

5 Open the Control Panel and double-click on the Network icon to return to the Network Configuration window, then go to step 4 of the **Configuring Windows NT** procedure.

ProxyServer
Internet Access Server

Chapter 6 - Warranty, Service and Tech Support

MultiTech Systems

Introduction

This chapter will provide you the resources for receiving service or support for your ProxyServer. The chapter starts with a description of the warranty, and continues with instructions for contacting the Service department, Technical Support group, and various Multi-Tech Internet resources.

Limited Warranty

Multi-Tech Systems, Inc. (“MTS”) warrants that its products will be free from defects in material or workmanship for a period of two years from the date of purchase, or if proof of purchase is not provided, two years from date of shipment. MTS MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. This warranty does not apply to any products which have been damaged by lightning storms, water, or power surges or which have been neglected, altered, abused, used for a purpose other than the one for which they were manufactured, repaired by the customer or any party without MTS’s written authorization, or used in any manner inconsistent with MTS’s instructions.

MTS’s entire obligation under this warranty shall be limited (at MTS’s option) to repair or replacement of any products which prove to be defective within the warranty period, or, at MTS’s option, issuance of a refund of the purchase price. Defective products must be returned by Customer to MTS’s factory transportation prepaid.

MTS WILL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES AND UNDER NO CIRCUMSTANCES WILL ITS LIABILITY EXCEED THE PURCHASE PRICE FOR DEFECTIVE PRODUCTS.

Online Warranty Registration

If you would like to register your ProxyServer electronically, you can do so at the following address:

http://www.multitech.com/support/register.htm

Tech Support

Multi-Tech has an excellent staff of technical support personnel available to help you get the most out of your Multi-Tech product. If you have any questions about the operation of this unit, call 1-800-972-2439. Please fill out the ProxyServer information (below), and have it available when you call. If your ProxyServer requires service, the tech support specialist will guide you on how to send in your equipment (refer to the next section).

Recording ProxyServer Information

Please fill in the following information on your ProxyServer. This will help tech support in answering your questions. (The same information is requested on the Warranty Registration Card.)

Model No.: _____
Serial No.: _____
Software Version: _____

The model and serial numbers are on the bottom of your ProxyServer.

Please note the type of external link device that is connected to your ProxyServer before calling tech support. Also, note the status of your ProxyServer including LED indicators, screen messages, diagnostic test results, DIP-Switch settings, problems with a specific application, etc. Use the space below to note the status:

_____

_____

_____

_____

_____

_____

_____

_____

Contacting Tech Support via E-mail

If you prefer to receive service online, via the Internet, you can contact Tech Support via e-mail at the following address:

http://www.multitech.com/_forms/email_tech_support.htm

Service

If your tech support specialist decides that service is required, your ProxyServer can be sent (freight prepaid) to our factory. Return shipping charges will be paid by Multi-Tech Systems.

Include the following with your ProxyServer:

- a description of the problem.
- return billing and return shipping addresses.
- contact name and phone number.
- check or purchase order number for payment if the ProxyServer is out of warranty. (Check with your technical support specialist for the standard repair charge for your ProxyServer).
- if possible, note the name of the technical support specialist with whom you spoke.

If you need to inquire about the status of the returned product, be prepared to provide the **serial number** of the product sent.

Send your ProxyServer to this address:

MULTI-TECH SYSTEMS, INC.

2205 WOODALE DRIVE

MOUNDS VIEW, MINNESOTA 55112

ATTN: SERVICE OR REPAIRS

You should also check with the supplier of your ProxyServer on the availability of local service and/or loaner units in your area.

The Multi-Tech BBS

For customers who do not have Internet access, Multi-Tech maintains a bulletin board system (BBS) that mirrors its FTP site. Information available from the BBS includes new product information, product upgrade files, and problem-solving tips. The phone number for the Multi-Tech BBS is (800) 392-2432 (USA and Canada) or (612) 785-3702 (international and local).

The BBS can be accessed by any asynchronous modem operating at 1200 bps to 33,600 bps at a setting of 8 bits, no parity, and 1 stop bit (8-N-1).

To log on to the Multi-Tech BBS

1. Set your communications program to **8-N-1**.
2. Dial our BBS at (800) 392-2432 (USA and Canada) or (612) 785-3702 (international and local).
3. At the prompts, type your first name, last name, and password; then press ENTER. If you are a first time caller, the BBS asks if your name is spelled correctly. If you answer yes, a questionnaire appears. You must complete the questionnaire to use the BBS on your first call.
4. Press ENTER until the Main Menu appears. From the Main Menu you have access to two areas: the Files Menu and News. For help on menu commands, type **?**.

To Download a file

If you know the file name

1. From the Main Menu, type **F** to access the Files Menu, then type **D**.
2. Enter the name of the file you wish to download from the BBS.
3. If a password is required, enter the password.
4. Answer **Y** or **N** to the automatic logoff question.
5. Select a file transfer protocol by typing the indicated letter, such as **Z** for Zmodem (the recommended protocol).
6. If you select Zmodem, the transfer will begin automatically. If you select another protocol, you may have to initiate the transfer yourself. (In most data communications programs, the PAGE DOWN key initiates the download.)
7. When the download is complete, press ENTER to return to the File Menu.
8. To exit the BBS, type **G** and press ENTER.

If you don’t know the file name

1. From the Main Menu, type **F** to access the Files Menu. For a list of file areas, type **L**, press ENTER, then type **L** and press ENTER again. (If you do not type the second *L*, you will list all of the files on the BBS.)
2. Mark each file area you would like to examine by typing its list number and pressing ENTER.
3. Enter **L** to list all the files in the selected file areas. Enter **C** to go forward in the file list and **P** to go back.
4. To mark one or more files for download, type **M**, press ENTER, type the list numbers of the files, and press ENTER again.
5. Enter **D**. You will see a list of the files you have marked. Enter **E** if you would like to edit the list; otherwise enter **D** again to start the download process.
6. Select a file transfer protocol by typing the indicated letter, such as **Z** for Zmodem (the recommended protocol).
7. If you select Zmodem, the file will transfer automatically. If you select another protocol, you may have to initiate the transfer yourself. (In most data communications programs, the PAGE DOWN key initiates the download.)
8. When the download is complete, press ENTER to return to the File Menu.
9. To exit the BBS, type **G** and press ENTER.

About Multi-Tech's Internet Presence

Multi-Tech is a commercial user on the Internet, and we retrieve messages from our customers on a periodic basis. Multi-Tech's presence includes a Web site at:

http://www.multitech.com

and an ftp site at:

ftp://ftp.multitech.com

About Ordering Accessories

SupplyNet, Inc. can supply you with replacement transformers, cables and connectors for select Multi-Tech products. You can place an order with SupplyNet via mail, phone, fax or the Internet at:

Mail: SupplyNet, Inc.
614 Corporate Way
Valley Cottage, NY 10989

Phone: 800 826-0279

Fax: 914 267-2420

Email: info@thesupplynet.com

Internet: http://www.thesupplynet.com

SupplyNet Online Ordering Instructions

1. Browse to http://www.thesupplynet.com. In the **Browse by Manufacturer** drop-down list, select **Multi-Tech** and click GO!
2. To order, type in quantity, and click Add to Order
3. Click Review Order to change your order
4. After you have selected all of your items click Checkout to finalize the order. The SupplyNet site uses Verisign's Secure Socket Layer (SSL) technology to ensure your complete shopping security.

About the Multi-Tech Fax-Back Service

Multi-Tech's fax-back system provides 24-hour access to sales, marketing, and technical literature. Dial 612-717-5888, follow the voice prompts, and request document number 10 for a catalog of available documents. For convenience, have your fax number handy: _____. From the catalog of available documents, you can order newsletters, white papers, press releases, etc. from the sales and marketing index (pages 1-4), or order basic modem operation and troubleshooting guides from the technical support and engineering index. Just enter the applicable FB Doc. # from the left column of the catalog.

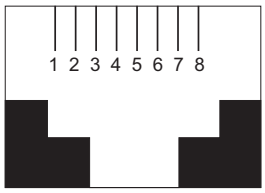
ProxyServer
Internet Access Server

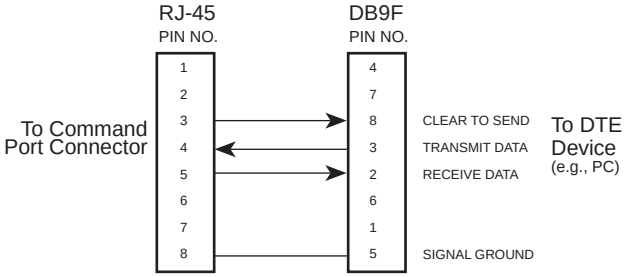
Appendixes

MultiTech Systems

Appendix A - Cabling Diagrams

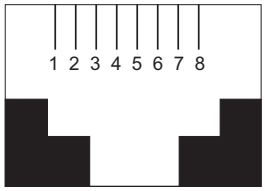
Command Port Cable





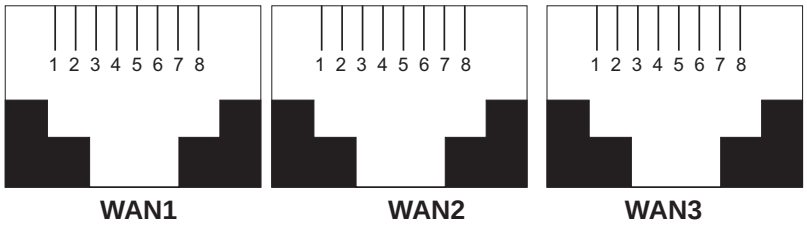
Note: RJ-45 pins 3,4,5, and 8 are the only ones used.

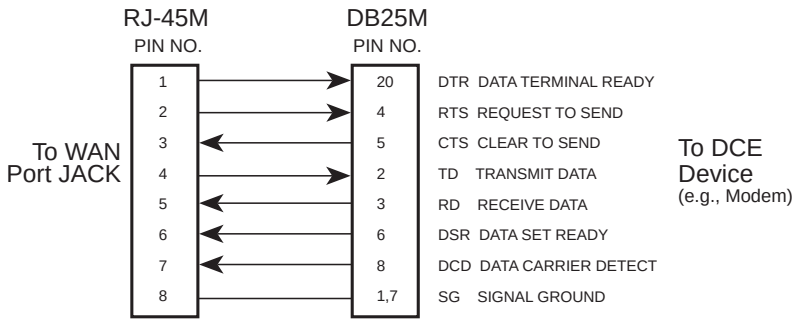
LAN Cable 10BaseT (RJ-45)



Pin	Circuit Signal Name	
1	TD+	Data Transmit Positive
2	TD-	Data Transmit Negative
3	RD+	Data Receive Positive
6	RD-	Data Receive Negative

WAN Cables (RJ-45)





Appendix B - Script Commands

A script file can be used to automate certain operations. The script file is a text file containing a sequence of the following commands (listed here according to their functions). This is similar to what you will find in the Help file in your ProxyServer software. Following the list of commands is an example script.

Commands (by Function)

Dial, Connection and Remote

BAUDRATE	BREAK	GETCTS
GETDCD	HANGUP	PARITY
RGETC	RGETS	RXFLUSH
SETDTR	SETRTS	STOPBITS
THISLAYERUP	TRANSMIT	TXFLUSH
WAITFOR		

Mathematical functions

DEC	INC

Miscellaneous

EXIT	WAIT

Program constructs

FOR	IF	PROC
SWITCH	WHILE	

String operations

ATOI	ITOA	STRCAT
STRCMP	STRCOPY	STRFMT
STRLEN	TOLOWER	TOUPPER

Example Script:

```
proc main;
      string login_prompt;
      string user_name;
      string password_prompt;
      string password;
      string shell_menu;
      string shell_menu_response;
      integer timeout;

      timeout=10;
      login_prompt=”login:”;
      user_name=”user1”;
      password_prompt=”Password:”;
      password=”user1”;
      shell_menu=”choice:”;
      shell_menu_response=”1”;

      transmit(“A”);
      wait(1)
      transmit(“T^M”);
      waitfor (“OK”,10);

      transmit (“A”);
      wait (1);
      transmit (“T”);
      wait (1);
      transmit (“DT963^M”);

      if (waitfor (login_prompt,60)) then
        transmit (user_name);
        transmit (“^M”);
        if (waitfor (password_prompt,timeout)) then
            transmit (password);
            transmit (“^M”);
             if (waitfor (shell_menu,timeout)) then
                transmit (shell_menu_response);
                transmit (“^M”);
       else
                transmit (“Shell Menu Not Received^M”);
       endif
      else
       transmit (“Password Prompt Not Received^M”);
       endif
      else
       transmit (“Login Prompt Not Received^M”);
      endif


Endproc
```

Appendix C - Regulatory Information

FCC Declaration

NOTE: This equipment has been tested and found to comply with the limits for a **Class B** digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference.

(2) This device must accept any interference received, including interference that may cause undesired operation.

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Modem CE Mark EMC and Safety Compliance

The CE mark is affixed to the enclosed Multi-Tech product to confirm compliance with the following European Community Directives:

Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of Member States relating to electromagnetic compatibility;

and

Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits;

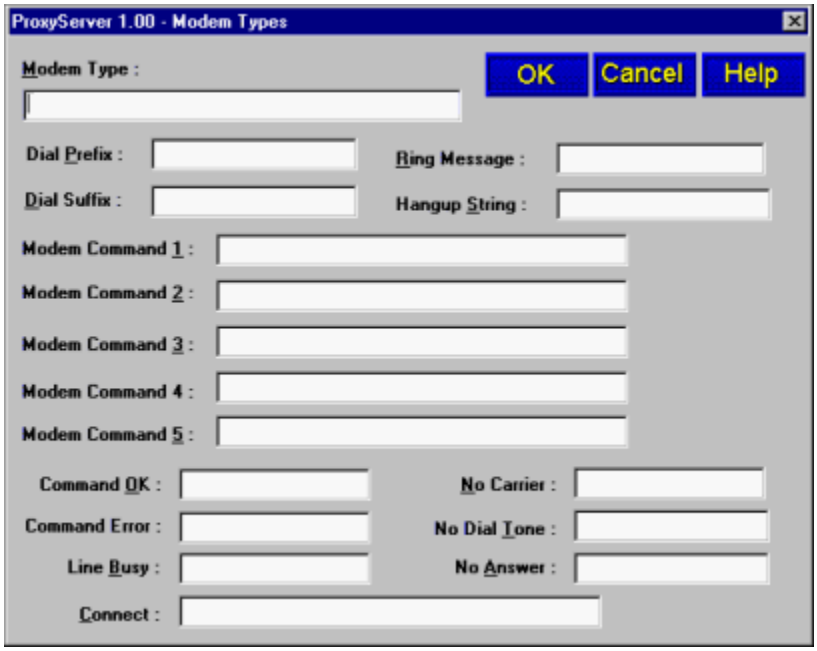
both amended by

Council Directive 93/68/EEC of 22 July 1993 on the harmonization of CE marking requirements.

Appendix D - Modifying Command and Response Strings

Modem Types

To add, edit or delete a modem configured for use on the WAN links, click on the **Advanced** tab in the **WAN Setup** dialog. Select the desired function by clicking the associated button (Add, Edit, Delete). The Modem Types dialog is displayed.



This dialog allows you to configure the command and response strings of connectable modems on the WAN ports. ProxyServer stores the information about all types of modems in a common modem configuration file called **modems.cnf**. This configuration file contains the commands that you want sent to the modem before dialing out.

You will notice that the modem highlighted in this dialog box is the modem you specified on the current communication link. Additionally, you will see the selected modem's communication strings.

You may program the Dial Prefix and Suffix, the Ring Message, the Hang-up String, and the Modem Command responses. Check your modem's owner manual for precise information on your modem's capabilities.

The Tilde, ~, signifies a delay of 0.5 seconds before transmission of the rest of the string. Sum consecutive tildes to increase the delay (i.e., ~~ equals one second). The caret, ^, signifies a control character, i.e., ^M means Control M, or carriage return.

ProxyServer
Internet Access Server

Glossary of Terms

MultiTech® Systems

A

Access: The T1 line element made up of two pairs of wire that the telephone company brings to the customer premises. The Access portion ends with a connection at the local telco (LEC or RBOC).

Accunet Spectrum of Digital Services (ASDS): The AT&T 56K bps leased (private) line service. Similar to services of MCI and Sprint. ASDS is available in nx56/64K bps, where n=1, 2, 4, 6, 8, 12.

ACK (ACKnowledgement code) (pronounced "ack"): A communications code sent from a receiving modem to a transmitting modem to indicate that it is ready to accept data. It is also used to acknowledge the error-free receipt of transmitted data. Contrast with NAK.

Adaptive Differential Pulse Code (ADCPM): In multimedia applications, a technique in which pulse code modulation samples are compressed before they are stored on a disk. ADCPM, an extension of the PCM format, is a standard encoding format for storing audio information in a digital format. It reduced storage requirements by storing differences between successive digital samples rather than full values.

Address: A numbered location inside a computer. It's how the computer accesses its resources, like a video card, serial ports, memory, etc.

AMI line coding: One of two common methods of T1 line coding (with B8ZS). AMI line coding places restrictions on user data (B8ZS does not).

Analog signal: A waveform which has amplitude, frequency and phase, and which takes on a range of values between its maximum and minimum points.

Analog Transmission: One of two types of telecommunications which uses an analog signal as a carrier of voice, data, video, etc. An analog signal becomes a carrier when it is modulated by altering its phase, amplitude and frequency to correspond with the source signal. Compare with digital transmission.

Application Program Interface (API): A software module created to allow dissimilar, or incompatible applications programs to transfer information over a communications link. APIs may be simple or complex; they are commonly required to link PC applications with mainframe programs.

ASCII (American Standard Code for Information Interchange) (pronounced "askey"): A binary code for data that is used in communications and in many computers and terminals. The code is used to represent numbers, letters, punctuation and control characters. The basic ASCII code is a 7-bit character set which defines 128 possible characters. The extended ASCII file provides 255 characters.

Asynchronous Transfer Mode (ATM): A very high-speed method of transmission that uses fixed-size cells of 53 bytes to transfer information over fiber; also known as cell relay.

AT Commands: A standard set of commands used to configure various modem parameters, establish connections and disconnect. The "AT" is used to get the "attention" of the modem before the actual command is issued.

Availability: The measure of the time during which a circuit is ready for use; the complement of circuit "outage" (100% minus % outage = % available).

B

B7ZS (Bipolar 7 Zero Suppression) line coding: One method of T1 line coding (see also "B8ZS" and "AMI"). B7ZS line coding does not place restrictions on user data (AMI does).

B8ZS (Bipolar 8 Zero Suppression) line coding: One of two common methods of T1 line coding (with AMI). B8ZS line coding does not place restrictions on user data (AMI does). A coding method used to produce 64K bps "clear" transmission. (See also "B7ZS" and "AMI" line coding)

Backbone: 1. A set of nodes and their interconnecting links providing the primary data path across a network. 2. In a local area network multiple-bridge ring configuration, a high-speed link to which the rings are connected by means of bridges. A backbone may be configured as a bus or as a ring. 3. In a wide area network, a high-speed link to which nodes or data switching exchanges (DSEs) are connected. 4. A common distribution core that provides all electrical power, gases, chemicals, and other services to the sectors of an automated wafer processing system.

Background: An activity that takes place in the PC while you are running another application. In other words, the active user interface does not correspond to the 'background' task.

Bandwidth: The transmission capacity of a computer channel, communications line or bus. It is expressed in cycles per second (hertz), the bandwidth being the difference between the lowest and highest frequencies transmitted. The range of usable frequencies that a transmission medium will pass without unacceptable attenuation or distortion. Bandwidth is a factor in determining the amount of information and the speed at which a medium can transmit data or other information.

Backward Explicit Congestion Notification (BECN): A bit that tells you that a certain frame on a particular logical connection has encountered heavy traffic. The bit provides notification that congestion-avoidance procedures should be initiated in the opposite direction of the received frame. See also FECN (Forward Explicit Congestion Notification).

Basic Rate Interface (BRI): An ISDN access interface type comprised of two B-channels each at 64K bps and one D-channel at 64K bps (2B+D).

Bell Operating Companies (BOC): The family of corporations created during the divestiture of AT&T. BOCs are independent companies which service a specific region of the US. Also called Regional Bell Operating Companies (RBOCs).

Bell Pub 41450: The Bell publication defining requirements for data format conversion, line conditioning, and termination for direct DDS connection.

Bell Pub 62310: The Bell publication defining requirements for data format conversion, line conditioning, and termination for direct DDS connection.

Binary Synchronous Communication (BSC): A form of telecommunication line control that uses a standard set of transmission control characters and control character sequences, for binary synchronous transmission of binary-coded data between stations.

Bit (Binary digIT): A bit is the basis of the binary number system. It can take the value of 1 or 0. Bits are generally recognized as the electrical charge generated or stored by a computer that represent some portion of usable information.

Bit Error Rate Test (BERT): A device or routine that measures the quality of data transmission. A known bit pattern is transmitted, and the errors received are counted and a BER (bit error rate) is calculated. The BER is the ratio of received bits in error relative to the total number of bits received, expressed in a power of 10.

Bit robbing: The use of the least significant bit per channel in every sixth frame for signaling. The line signal bits "robbed" from the speech part conveys sufficient pre-ISDN telephony signaling information with the remaining line signal bits providing sufficient line signaling bits for recreating the original sound. See "robbed bit signaling".

Blue Alarm: An error indication signal consisting of all 1s indicating disconnection or attached device failure. Contrast "Red Alarm" and "Yellow Alarm".

Bps (bits per second): A unit to measure the speed at which data bits can be transmitted or received. Bps differs from baud when more than one bit is represented by a single cycle of the carrier.

Bridges: 1. A functional unit that interconnects two local area networks that use the same logical link protocol but may use different medium access control protocols. 2. A functional unit that interconnects multiple LANs (locally or remotely) that use the same logical link control protocol but that can use different medium access control protocols. A bridge forwards a frame to another bridge based on the medium access control (MAC) address. 3. In the connection of local loops, channels, or rings, the equipment and techniques used to match circuits and to facilitate accurate data transmission.

Buffer: A temporary storage register or Random Access Memory (RAM) used in all aspects of data communications which prevents data from being lost due to differences in transmission speed. Keyboards, serial ports, muxes and printers are a few examples of the devices that contain buffers.

Bus: A common channel between hardware devices either internally between components in a computer, or externally between stations in a communications network.

Byte: The unit of information a computer can handle at one time. The most common understanding is that a byte consists of 8 binary digits (bits), because that's what computers can handle. A byte holds the equivalent of a single character (such as the letter A).

C

Call Setup Time: The time to establish a circuit-switched call between two points. Includes dialing, wait time, and CO/long distance service movement time.

Carrier Group Alarm (CGA): A T1 service alarm generated by a channel bank when an OOF condition occurs for a predefined length of time (usually 300mS to 2.5 seconds). The CGA causes the calls using a trunk to be dropped and for trunk conditioning to be applied.

Carrier signal: An analog signal with known frequency, amplitude and phase characteristics used as a transport facility for useful information. By knowing the original characteristics, a receiver can interpret any changes as modulations, and thereby recover the information.

CCITT (Consultative Committee for International Telephone and Telegraph): An advisory committee created and controlled by the United Nations and headquartered in Geneva whose purpose is to develop and to publish recommendations for worldwide standardization of telecommunications devices. CCITT has developed modem standards that are adapted primarily by PTT (post, telephone and telegraph) organizations that operate telephone networks of countries outside of the U.S. See also ITU.

Central Office (CO): The lowest, or most basic level of switching in the PSTN (public switched telephone network). A business PABX or any residential telephone connects to the PSTN at a central office.

Centrex: A multi-line service offered by operating telcos which provides, from the telco CO, functions and features comparable to those of a PBX for large business users. See also "Private Branch Exchange", "Exchange".

Channel: A data communications path between two computer devices. Can refer to a physical medium (e.g., UTP or coax), or to a specific carrier frequency.

Channel Bank: A device that acts as a converter, taking the digital signal from the T1 line into a phone system and converting it to the analog signals used by the phone system. A channel bank acts as a multiplexer, placing many slow-speed voice or data transactions on a single high-speed link.

Circuit-switched Network: A technology used by the PSTN that allocates a pair of conductors for the exclusive use of one communication path. Circuit switching allows multiple conversations on one talk path only if the end-users multiplex the signals prior to transmission.

Circuit Switching: The temporary connection of two or more communications channels using a fixed, non-shareable path through the network. Users have full use of the circuit until the connection is terminated.

Clear Channel: A transmission path where the full bandwidth is used (i.e., no bandwidth needed for signaling, carrier framing or control bits). A 64K bps digital circuit usually has 8K bps used for signaling. ISDN has two 64K bps circuits, and a 16K bps packet service of which part is used for signaling on the 64K channels.

Client-Server: In TCP/IP, the model of interaction in distributed data processing in which a program at one site sends a request to a program at another site and awaits a response. The requesting program is called a client; the answering program is called a server.

Cluster Controller: A device that can control the input/output operations of more than one device connected to it. A cluster controller may be controlled by a program stored and executed in the unit, or it may be entirely controlled by hardware.

Committed Burst Size: The maximum number of bits that the frame relay network agrees to transfer during any measurement interval.

Committed Information Rate (CIR): An agreement a customer makes to use a certain minimum data transmission rate (in bps). The CIR is part of the frame relay service monthly billing, along with actual usage, that users pay to their frame relay service provider.

Compression: 1. The process of eliminating gaps, empty fields, redundancies, and unnecessary data to shorten the length of records or blocks. 2. In SNA, the replacement of a string of up to 64-repeated characters by an encoded control byte to reduce the length of the data stream to the LU-LU session partner. The encoded control byte is followed by the character that was repeated (unless that character is the prime compression character). 3. In Data Facility Hierarchical Storage Manager, the process of moving data instead of allocated space during migration and recall in order to release unused space. 4. Contrast with decompression.

COMx Port: A serial communications port on a PC.

congestion: A network condition where there is too much data traffic. The ITU I.233 standard defines congestion managemennt in terms of speed and burstiness.

congestion notification: The function in frame relay that ensures that user data transmitted at a rate higher than the CIR are allowed to slow down to the rate of the available network bandwidth.

Consecutive Severely Errored Seconds (CSES): An error condition that occurs when from 3 to 9 SES (Severely Errored Seconds) are logged consecutively.

Customer Premise Equipment (CPE): The generic term for data comm and/or terminal equipment that resides at the user site and is owned by the user with the following exclusions: Over voltage protection equipment, inside wiring, coin operated or pay telephones, “company-official” equipment, mobile telephone equipment, “911” equipment, equipment necessary for the provision of communications for national defense, or multiplexing equipment used to deliver multiple channels to the customer.

D

D4: the T1 4th generation channel bank.

D4 channelization: Refers to the compliance with AT&T TR 62411 for DS1 frame layout.

D4 framing: The T1 format for framing in AT&T D-Series channel banks, in which there are 12 separate 193-bit frames in a super-frame. A D4 framing bit is used to identify the channel and the signaling frame. Signalling for voice channels is carried in-band for every channel, along with the encoded voice. See “robbed-bit signaling”.

Data Communications Equipment (DCE): Any device which serves as the portal of entry from the user equipment to a telecommunications facility. A modem is a DCE for the telephone network (PSTN) that is commonly on site at the user’s premises. Packet Switched Networks have another level of DCE which is most often located at a central office.

Data Link Connection Identifier (DLCI): One of the six components of a frame relay frame. Its purpose is to distinguish separate virtual circuits across each access connection. Data coming into a frame relay node is thus allowed to be sent across the interface to the specified “address”. The DLCI is confirmed and relayed to its destination, or if the specification is in error, the frame is discarded.

Dataphone Digital Service (DDS): A private line digital service that offers 2400, 4800, 9600 and 56K bps data rates on an inter-LATA basis by AT&T and on an intra-LATA basis by the BOCs.

Data Service Unit (DSU): A device that provides a digital data service interface directly to the data terminal equipment. The DSU provides loop equalization, remote and local testing capabilities, and a standard EIA/CCITT interface.

Dedicated Line: A communication line that is not switched. The term leased line is more common.

Default: This is a preset value or option in software packages, or in hardware configuration, that is used unless you specify otherwise.

Device driver: Software that controls how a computer communicates with a device, such as a printer or mouse.

Digital Cross-connect System (DCS): The CO device which splits and redistributes the T1 bandwidth. The DCS takes time slots from various T1 lines and alters them to provide the needed connectivity. DCS connections are made with software at an administrator’s workstation.

Digital Data: Information represented by discrete values or conditions (contrast “Analog Data”).

Digital Loopback: A technique used for testing the circuitry of a communications device. Can be initiated locally, or remotely (via a telecommunications device). The tested device decodes and encodes a received test message, then echoes the message back. The results are compared with the original message to determine if corruption occurred en route.

Digital PBX: A Private Branch Exchange that operates internally on digital signals. See also “Exchange”.

Digital Service, level 0 (DS0): The worldwide standard speed (64K bps) for digital voice conversation using PCM (pulse coded modulation).

Digital Service, level 1 (DS1): The 1.544M bps voice standard (derived from an older Bell System standard) for digitized voice transmission in North America. The 1.544M bps consists of 24 digitally-encoded 64K bps voice channels (north America) and 2.048M bps (30 channels) elsewhere.

Digital Signal: A discrete or discontinuous signal (e.g., a sequence of voltage pulses). Digital devices, such as terminals and computers, transmit data as a series of electrical pulses which have discrete jumps rather than gradual changes.

Digital Signaling Rates (DSn): A hierarchical system for transmission rates, where “DS0” is 64K bps (equivalent to ISDN B channel), and DS1 is 1.5 Mbps (equivalent to ISDN PRI).

Digital Transmission: A method of electronic information transmission common between computers and other digital devices. Analog signals are waveforms: a combination of many possible voltages. A computer’s digital signal may be only “high” or “low” at any given time. Therefore, digital signals may be “cleaned up” (noise and distortion removed) and amplified during transmission.

Digitize: To convert an analog signal to a digital signal.

DIP switch (pronounced “dip switch”): A set of tiny toggle switches, built into a DIP (dual in-line package), used for setting configurable parameters on a PCB (printed circuit board).

Driver: A software module that interfaces between the Operating System and a specific hardware device (e.g., color monitors, printers, hard disks, etc.). Also known as a device driver.

Drop and Insert: The process where a portion of information carried in a transmission system is demodulated (“Dropped”) at an intermediate point and different information is included (“Inserted”) for subsequent transmission.

DTE (Data Terminal Equipment): A term used to include any device in a network which generates, stores or displays user information. DTE is a telecommunications term which usually refers to PCs, terminals, printers, etc.

DTMF (Dual-Tone MultiFrequency): A generic push-button concept made popular by AT&T TouchTone.

E

E&M: A telephony trunking system used for either switch-to-switch, or switch-to-network, or computer/telephone system-to-switch connection.

EIA: The Electronics Industries Association is a trade organization in Washington, DC that sets standards for use of its member companies. (See RS-232, RS-422, RS530.)

Encapsulation: A technique used by network-layer protocols in which a layer adds header information to the protocol data unit from the preceding layer. Also used in “enveloping” one protocol inside another for transmission. For example, IP inside IPX.

Errored Seconds (ES): Any second of operation that all 1.544M bits are not received exactly as transmitted. Contrast “Error Free Seconds”.

Error Free Seconds (EFS): Any second of operation that all 1.544M bits are received exactly as transmitted. Contrast “Errored Seconds”.

ESF Error Event: A T1 error condition that is logged when a CRC-6 error or an Out-Of-Frame (OOF) error occurs.

Ethernet: A 10-megabit baseband local area network that allows multiple stations to access the transmission medium at will without prior coordination, avoids contention by using carrier sense and deference, and resolves contention by using collision detection and transmission. Ethernet uses carrier sense multiple access with collision detection (CSMA/CD).

Excess Zeros: A T1 error condition that is logged when more than 15 consecutive 0s or fewer than one 1 bit in 16 bits occurs.

Exchange: A unit (public or private) that can consist of one or more central offices established to serve a specified area. An exchange typically has a single rate of charges (tariffs) that has previously been approved by a regulatory group.

Exchange Area: A geographical area with a single uniform set of charges (tariffs), approved by a regulatory group, for telephone services. Calls between any two points within an exchange area are local calls. See also “Digital PBX”, “PBX”.

Exchange Termination (ET): The carrier’s local exchange switch. Contrast with “Loop Termination - LT”.

Explicit Congestion Management: The method used in frame relay to notify the terminal equipment that the network is overly busy. The use of FECN and BECN is called explicit congestion management. Some end-to-end protocols use FECN or BECN, but usually not both options together. With this method, a congestion condition is identified and fixed before it becomes critical. Contrast with “implicit congestion”.

Extended Super Frame (ESF): One of two popular formats for framing bits on a T1 line. ESF framing has a 24-frame super-frame, where robbed bit signaling is inserted in the LSB (bit 8 of the DS-0 byte) of frames 6, 12, 18 and 24. ESF has more T1 error measurement capabilities than D4 framing. Both ESF and B8ZS are typically offered to provide clear channel service.

F

Failed Seconds: A test parameter where the circuit is unavailable for one full second.

Failed Signal: A T1 test parameter logged when there are more than 9 SES (Severely Errored Seconds).

Fax (facsimile): Refers to the bit-mapped rendition of a graphics-oriented document (fax) or to the electronic transmission of the image over telephone lines (faxing). Fax transmission differs from data transmission in that the former is a bit-mapped approximation of a graphical document and, therefore, cannot be accurately interpreted according to any character code.

Firmware: A category of memory chips that hold their content without electrical power, they include ROM, PROM, EPROM and EEPROM technologies. Firmware becomes “hard software” when holding program code.

Foreground: The application program currently running on and in control of the PC screen and keyboard. The area of the screen that occupies the active window. Compare with “background”.

Fractional T1 (FT1): A digital data transmission rate between 56K bps (DS0 rate) and 1.544M bps (the full T1 rate - in North America). FT1 is typically provided on 4-wire (two copper pairs) UTP. Often used for video conferencing, imaging and LAN interconnection due to its low cost and relatively high speed. FT1 rates are offered in 64K bps multiples, usually up to 768K bps.

Frequency: A characteristic of an electrical or electronic signal which describes the periodic recurrence of cycles. Frequency is inversely proportional to the wavelength or pulse width of the signal (i.e., long wavelength signals have low frequencies and short wavelength signals yield high frequencies).

Foreign Exchange (FX): A CO trunk with access to a distant CO, allowing ease of access and flat-rate calls anywhere in the foreign exchange area.

Foreign Exchange Office (FXO): provides local telephone service from a CO outside of (“foreign” to) the subscriber’s exchange area. In simple form, a user can pick up the phone in one city and receive a tone in the foreign city. Connecting a POTS telephone to a computer telephony system via a T1 link requires a channel bank configured for the FX connection. To generate a call from the POTS set to the computer telephony system, a FXO connection must be configured.

Foreign Exchange Station (FXS): See FX, FXO. To generate a call from the computer telephony system to the POTS set, an FXS connection must be configured.

Forward Explicit Congestion Notification (FECN): A bit that tells you that a certain frame on a particular logical connection has encountered heavy traffic. The bit provides notification that congestion-avoidance procedures should be initiated in the same direction of the received frame. See also BECN (Backward Explicit Congestion Notification).

Frame: A group of data bits in a specific format to help network equipment recognize what the bits mean and how to process them. The bits are sent serially, with a flag at each end signifying the start and end of the frame.

Frame Relay: A form of packet switching that uses small packets and that requires less error checking than other forms of packet switching. Frame relay is effective for sending “bursty” data at high speeds (56/64K, 256K, and 1024K bps) over wide area networks. Frame Relay specifications are defined by ANSI documents ANSI T1.602, T1.606, T1S1/90-175, T1S1/90-213, and T1S1/90-214. In using frame relay, blocks of information (frames) are passed across a digital network interface using a “connection number” that is applied to each frame to distinguish between individual frames.

Frame Relay Forum: A nonprofit organization of 300+ vendors and service providers, based in Foster City, CA, that are developing and deploying frame relay equipment.

Frame Relay Implementors Forum: A group of companies supporting a common specification for frame relay connection to link customer premises equipment to telco network equipment. Their specification supports ANSI frame relay specs and defines extensions such as local management.

Frame Relay Access Device (FRAD): A piece of equipment that acts as a concentrator or frame assembler/dissassembler that can support multiple protocols and provide basic "routing" functions.

G

Gateway: 1. A functional unit that interconnects two computer networks with different network architectures. A gateway connects networks or systems of different architectures. A bridge interconnects networks or systems with the same or similar architectures. 2. A network that connects hosts.

Graphical User Interface (GUI): A type of computer interface consisting of a visual metaphor of a real-world scene, often of a desktop. Within that scene are icons, representing actual objects, that the user can access and manipulate with a pointing device.

H

Handshaking: A process that two modems go through at the time of call setup to establish synchronization over the data communications link. It is a synchronization and negotiation process accomplished by the exchange of predefined, mutually recognized control codes.

High-level Data Link Control (HDLC): An ISO standard, bit-oriented data communications protocol that provides nearly error-free data transfers.

I

Hexadecimal: A base 16 numbering system used to represent binary values. Hex uses the numbers 0-9 and the letters A-F: usually notated by an "h" (e.g., "4CF h", read "four charley fox, hex"). The result is that one hex digit represents a 4-bit value.

Implicit congestion management: A method of informing the terminal that the network is busy. This method relies on the end-system protocol to detect and fix the congestion problem. (TCP/IP is an example of a protocol using only implicit congestion management.) See also "explicit congestion management".

In-band: Refers to the type of signalling over the conversion path on an ISDN call. Contrast "out-of-band".

Insufficient Ones: A T1 error condition that is logged when fewer than one 1 in 16 0s or less than 12.5 % average 1s density is received.

Inter Exchange Carrier (IEC): The long distance company (LE) who's central office provides the point of reference for T1 access. Any common carrier authorized by the FCC to carry customer transmissions between LATAs.

Internet: Refers to the computer network of many millions of university, government and private users around the world. Each user has a unique Internet Address.

Internet Address (IP Address): A unique 32-bit address for a specific TCP/IP host on a network. Normally printed in dotted decimal format (e.g., 129.128.44.227).

Internet Protocol (IP): A protocol used to route data from its source to its destination in an Internet environment. The Internet Protocol was designed to connect local area networks. Although there are many protocols that do this, IP refers to the global system of interconnecting computers. It is a highly distributed protocol (each machine only worries about sending data to the next step in the route).

Internetwork Packet Exchange (IPX): A NetWare communications protocol used to route messages from one node to another. IPX packets include network addresses and can be routed from one network to another. An IPX packet can occasionally get lost when crossing networks, thus IPX does not guarantee delivery of a complete message. Either the application has to provide that control, or NetWare's SPX protocol must be used.

Inter-operable: Devices from different vendors that can exchange information using a standard's base protocol.

I/O Addresses: Locations within the I/O address space of your computer used by a device, such as an expansion card, a serial port, or an internal modem. The address is used for communication between software and a device.

IRQ Level (Interrupt Request Level): The notification a processor receives when another portion of the computer's hardware requires its attention. IRQs are numbered so that the device issuing the IRQ can be identified, and so IRQs can be prioritized.

ISA (Industry Standards Architecture) (pronounced "ice a"): The classic 8 or 16-bit architecture introduced with IBM's PC-AT computer.

ISDN (Integrated Services Digital Network): An International telecommunications standard for transmitting voice, video and data over a digital communications line. ISDN is a worldwide telecommunications service that uses digital transmission and switching technology to support voice and digital data communications. Frame relay was partially based on ISDN's data link layer protocol (LAPD). Frame relay can be used to transmit across ISDN services offering circuit-switched connection at 64K bps and higher speeds. Contrast Public Switched Telephone Network (PSTN).

ITU-TSS (formerly CCITT): International Telecommunications Union-Telecommunications Sector; the United Nations organization that prepares standards ("Recommendations") for resolving communications issues and problems.

J

No Entries.

K

Key Telephone System (KTS): Phone devices with multiple buttons that let you select incoming or outgoing CO phone lines directly. Similar in operation to a PBX, except with a KTS you don't have to dial a "9" for a call outside the building.

Key Service Unit (KSU): A small device containing the switching electronics for a business key telephone system (KTS).

Key Set: A telephone set with several buttons for call holding, line pickup, intercom, autodialing, etc. Also called a touchtone phone (Ericsson) and a KTS (Key Telephone Set).

L

LAPB: Link Access Procedure Balanced; based on the X.25 Layer 2 specification. A full-duplex point-to-point, bit-synchronous protocol commonly used as a data link control protocol to interface X.25 DTEs. LAPB is the link initialization procedure that establishes and maintains communications between the DTE and the DCE.

LAPD: Link Access Protocol for the D-Channel; based on the ISDN Q.921 specification. A full-duplex, point-to-point bit-synchronous link-level protocol for ISDN connections; different from LAPB in its framing sequence. Transmission is in units called “frames”, and a frame may contain one or more X.25 packets.

Line Coding: The representation of 1s and 0s on a T1 line. The two methods of line coding commonly used, B8ZS and AMI, differ in the restrictions placed on user data. T1 line coding ensures that sufficient timing information is sent with the digital signal to ensure recovery of all the bits at the far end. Timing information on the T1 line is included in the form of 1s in the data stream; a long string of 0s in the data stream could cause problems recovering the data.

Line Termination (LT): The electronics at the ISDN network side of the user/network interface that complements the NT1 at the user side. The LT and the NT1 together provide the high-speed digital line signals required for BRI access.

Listed Directory Number (LDN): The main number assigned by the telco; the number listed in the telephone directory and also provided by Directory Assistance. Some devices can have more than one LDN, such as ISDN devices that have one LDN for voice and another LDN for data.

Local Area Network (LAN): 1. A computer network located on a user’s premises within a limited geographical area. Communication within a local area network is not subject to external regulations; however, communication across the LAN boundary may be subject to some form of regulation. 2. A LAN does not use store-and-forward techniques. 3. A network in which a set of devices are connected to one another for a communication and that can be connected to a larger network.

Local Access and Transport Area (LATA): A post-divestiture geographical area generally equivalent to a Standard Metropolitan Statistical Area. At divestiture, the territory served by the Bell system was divided into approximately 161 LATAs. The Bell Operating Companies (BOCs) provide Intra-LATA services.

Local Exchange Carrier (LEC): The local phone company which provides local (i.e., not long distance) transmission services. AKA “telco”. LECs provide T1 or FT1 access to LDCs (unless the T1 circuit is completely intra-LATA). Inter-LATA T1 circuits are made up of a combination of Access and Long Haul facilities.

Local Management Interface (LMI): A specification for frame relay equipment that defines status information exchange.

Local Loop: A transmission path, typically twisted-pair wire, between an individual subscriber and the nearest public telecommunications network switching center. The wires provide ISDN service, but require an NT1 at the user end and an LT at the network end. (AKA, “loop” or “subscriber loop”.)

Logical Link Control (LLC2): In a local area network, the protocol that governs the exchange of transmission frames between data stations independently of how the transmission medium is shared. The LLC2 protocol was developed by the IEEE 802 commitee and is common to all LAN standards.

Logical Unit (LU): A type of network accessible unit that enables end users to gain access to network resources and communicate with each other.

Long Haul: The T1 element that connects to the Access portion of the long distance company’s (LDC’s) central office. The LDC is commonly called the point of presence (POP). Each LDC has a number of POPs, located throughout the country. The LDC is also called an IEC (Inter Exchange Carrier).

Long Haul Communications: The type of phone call reaching outside of a local exchange (LE).

M

Management Information Base (MIB): A database of network management information used by the Common Management Information Protocol (CMIP) and the Simple Network Management Protocol (SNMP).

Megacom: An AT&T service with a normal WATS line (typically T1) between the customer premise and the AT&T serving class 4 CO are the customer’s responsibility.

MegaLink: BellSouth’s leased T1 service.

Message: Associated with such terms as packet, frame, and segment. 1. In information theory, an ordered series of characters intended to convey information. 2. An assembly of characters and sometimes control codes that is transferred as an entry from an originator to one or more recipients.

Modem: A communications device that enables a computer to transmit information over a telephone line. It converts the computer’s digital signals into analog signals to send over a telephone line and converts them back to digital signals at the receiving end. Modems can be internal and fit into an expansion slot, or external and connect to a serial port.

Multiplexer (Mux): 1. A device that takes several input signals and combines them into a single output signal in such a manner that each of the input signals can be recovered. 2. A device capable of interleaving the events of two or more activities or capable of distributing the events of an interleaved sequence to the respective activities. 3. Putting multiple signals on a single channel.

Multiprotocol: A device that can interoperate with devices utilizing different network protocols.

Multithreading: The ability of a software system to be able to handle more than one transaction concurrently. This is contrasted to the case where a single transaction is accepted and completely processed before the next transaction processing is started.

N

Nailed Connection: A permanent or dedicated circuit of a previously switched circuit or circuits.

Nailed-up Circuit: A semi-permanent circuit established through a circuit-switching facility for point-to-point connectivity.

NAK (Negative Acknowledgment): Communications code used to indicate that a message was not properly received, or that a terminal does not wish to transmit. Contrast with ACK.

Network: A group of computers connected by cables or other means and using software that enables them to share equipment, such as printers and disk drives to exchange information.

Node: Any point within a network which has been assigned an address.

O

Object-Oriented: A method for structuring programs as hierarchically organized classes describing the data and operations of objects that may interact with other objects.

Office Channel Unit - Data Port (OCU-DP): The CO channel bank used as the interface between the customer's DSU and the channel bank.

Off-hook: The condition of a device which has accessed a phone line (with or without using the line). In modem use, this is equivalent to a telephone handset being picked up. Dialing and transmission are allowed, but incoming calls are not answered. Contrast "on-hook".

Off Premise Extension (OPX): An extension or phone that terminates in a location other than that of the PBX. Commonly used to provide a corporate member with an extension of the PBX at home.

Ones Density: the measure of the number of logical 1s on a T1 line compared to a given total number of bits on that line; used for timing information in data recovery in AMI and B8ZS.

On-Hook: The condition of a device which has not accessed a phone line. In modem use, this is equivalent to a telephone handset that has not been picked up. In other words, it can receive an incoming call. Contrast "off-hook".

Open Shortest Path First (OSPF): A hierarchical Interior Gateway Protocol (IGP) routing algorithm for IP that is a proposed standard for the Internet. OSPF incorporates least-cost routing, equal-cost routing, and load balancing.

Outage: The measure of the time during which a circuit is not available for use due to service interrupt. Outage is the complement of circuit "availability" (100% minus % available = % outage).

Out-of-band: Signaling that is separated from the channel carrying the information (e.g., the voice/data/video signal is separate from the carrier signal). Dialing and various other "supervisory" signals are included in the signaling element. Contrast "In-band" signaling.

Out of Frame (OOF): A T1 alarm condition that is logged on the loss of 2, 3 or 4 of 5 consecutive FT framing bits.

P

Packet: 1. In data communication, a sequence of binary digits, including data and control signals, that is transmitted and switched as a composite whole. The data, control signals and, possibly, error control information are arranged in a specific format. 2. Synonymous with data frame. 3. In TCP/IP, the unit of data passed across the interface between the Internet layer and the link layer. A packet includes an IP header and data. A packet can be a complete IP datagram or a fragment of an IP diagram. 4. In X.25, a data transmission information unit. A group of data and control characters, transferred as a unit, determined by the process of transmission. Commonly used data field lengths in packets are 128 or 256 bytes. 5. The field structure and format defined in the CCITT X.25 recommendation.

Packet Assembler/Dissembler (PAD): Used by devices to communicate over X.25 networks by building or stripping X.25 information on or from a packet.

Packet Data: The information format ("packetized") used for packet-mode calls.

Packet Mode: Refers to the switching of chunks of information for different users using statistical multiplexing to send them over the same transmission facility.

Parity bit: An extra bit attached to each byte of synchronous data used to detect errors in transmission.

Permanent Virtual Circuit (PVC): A connection between two endpoints dedicated to a single user. In ISDN, PVCs are established by network administration and are held for as long as the user subscribes to the service.

Physical Unit (PU): The component that manages and monitors the resources (such as attached links and adjacent link stations) associated with a node, as requested by an SSCP via an SSCP-PU session. An SSCP activates a session with the physical unit in order to indirectly manage, through the PU, resources of the node such as attached links. This term applies to type 2.0, type 4, and type 5 nodes only.

Point of Presence (POP): The central office's end points of the long distance carriers.

Point-to-Point Protocol (PPP): A protocol that lets a PC user access TCP/IP (Internet member) using an ISDN terminal adapter or a high-speed modem over a standard telephone line.

Port: A location for input or output data exchange. Computers, muxes, etc. have ports for various purposes.

Primary Rate Interface (PRI): Used on ISDN. In North America, and Japan, PRI is one 64Kbps D channel and 23 B channels. Elsewhere, it is one D channel and 30 B channels.

Primitive: An abstract representation of interaction across the access points indicating that information is being passed between the service user and the service provider. The OSI Reference Model defines four types of primitives: Request, Indication, Response and Confirm.

Private Branch Exchange (PBX): A telephone exchange located on the customer's premises. The PBX provides a circuit switching facility for telephone extension lines within the building, and access to the public telephone network. See also "Exchange".

PROM (Programmable Read Only Memory - pronounced "prom"): A permanent memory chip that can be programmed or filled by the customer after by the manufacturer has set initial values. Contrast with ROM.

Protocol: 1. A set of semantic and syntactic rules that determines the behavior of functional units in achieving communication. 2. In Open Systems Interconnection architecture, a set of semantic and syntactic rules that determine the behavior of entities in the same layer in performing communication functions. 3. In SNA, the meanings of and the sequencing rules for requests and responses used for managing the network, transferring data, and synchronizing the states of network components. 4. Synonymous with line control discipline.

Proxy Server: A secure gateway that provides multiple LAN users with high performance Internet access by functioning as a TCP/IP proxy server that resides on the outer edge of a firewall.

PSTN (Public Switched Telephone Network): A worldwide public voice telephone network that is used as a telecommunications medium for the transmission of voice, data and other information.

Public Data Network (PDN): A packet-switched network that is available to the public for individual ("subscriber") use. Typically, controlled by a government or a national monopoly.

Public Switched Telephone Network (PSTN): The group of circuit-switching voice carriers, which are commonly used as analog data communications services.

Pulse Code Modulation (PCM): 1. In data communication, variation of a digital signal to represent information; for example, by means of pulse amplitude modulation (PAM), pulse duration modulation (PDM), or pulse position modulation (PPM). 2. Transmissions of analog information in digital form through sampling and encoding the samples with a fixed number of bits.

Pulse dialing: One of two methods of dialing a telephone, usually associated with rotary-dial phones. Compare with "tone dialing".

Q

Quantizing: The process of analog-to-digital conversion by assigning a range, from the contiguous analog values, to a discrete number.

R

Random Access Memory (RAM): A computer's primary workspace. All data must be stored in RAM (even for a short while), before software can use the processor to manipulate the data. Before a PC can do anything useful it must move programs from disk to RAM. When you turn it off, all information in RAM is lost.

Rate Enforcement: The concept in frame relay where frames sent faster than the CIR are to be carried only if the bandwidth is available, otherwise they are to be discarded. (The frame relay network assumes that anything exceeding the CIR is of low priority.) Rate enforcement makes sure that the network will not get so congested that it isn't able to meet the agreed on CIR.

Recognized Private Operating Agency (RPOA): A corporation, private or government-controlled, that provides telecommunications services. RPOAs, such as AT&T, participate as non-voting members in the CCITT.

Red Alarm: A T1 error condition generated when a local failure (e.g., loss of synchronization) exists for 2.5 seconds, causing a Carrier Group Alarm (CGA). See also "Blue Alarm" and "Yellow Alarm".

Request for Comment (RFC): A set of papers in which Internet standards (published and proposed), along with generally-accepted ideas, proposals, research results, etc. are published.

Ring Down Box: A device that emulates a CO by generating POTS calls for testing and product demos.

Ring Down Circuit: A tie line connecting phones where picking up one phone automatically rings another phone. A feature used for emergencies to alert the person at the other phone of the incoming call.

RJ-11: An industry standard interface used for connecting a telephone to a modular wall outlet; comes in 4-and 6-wire packages.

RJ-45: An 8-wire modular connector for voice and data circuits.

Robbed Bit Signaling: The popular T1 signaling mechanism where the A and B bits are sent by each side of the T1 termination and are "buried" in the voice data of each voice channel in the T1 circuit. Since the bits are "robbed" infrequently, voice quality remains relatively uncompromised. See "bit robbing". The robbed-bit signaling technique is used in D4 channel banks to convey signaling information. The eighth (least significant) bit of each of the 24 8-bit time slots is "robbed" every sixth frame to convey voice-related signaling information such as on-hook, off-hook, etc., for each channel.

Router: A device that connects two networks using the same networking protocol. It operates at the Network Layer (Layer 3) of the OSI model for forwarding decisions.

Routing Information Protocol (RIP): A distance vector-based protocol that provides a measure of distance, or hops, from a transmitting workstation to a receiving workstation.

RS-232C: An EIA standard for a serial interface between computers and peripheral devices (modem, mouse, etc.). It uses a 25-pin DB-25, or a 9-pin DB-9 connector. The RS-232 standard defines the purposes, electrical characteristics and timing of the signals for each of the 25 lines.

RS-422: The EIA standard for a balanced interface with no accompanying physical connector. RS-422 products can use screw terminals, DB-9 various DB-25 and DB-37 connectors.

RS-530: The EIA standard for the mechanical/electrical interface between DCEs and DTEs transmitting synchronous or asynchronous serial binary data. RS-530 provides for high data rates with the same connector used for RS-232; however, it is incompatible with RS-232.

S

Serial Port: The connector on a PC used to attach serial devices (those that need to receive data one bit after another), such as a mouse, a printer or a modem. This consists of a 9- or 25-pin connector that sends data in sequence (bit by bit). Serial ports are referred to as "COMx" ports, where x is 1 to 4 (i.e., COM1 through COM4). A serial port contains a conversion chip called a "UART" which translates between internal parallel and external serial formats.

Service: The requirements offered by an RPOA to its customers to satisfy specific telecommunications needs.

Severely Errored Seconds (SES): Refers to a typical T1 error event where an error burst occurs (a short term, high bit-error rate that is self-clearing). Per the ITU-T (CCITT) G.821: any second in which the BER is less than 1x10 -3 .

Signaling: The process of establishing, maintaining, accounting for, and terminating a connection between two endpoints (e.g., the user premises and the telco CO). Central office signals to the user premises can include ringing, dial tone, speech signals, etc. Signals from the user's telephone can include off-hook, dialing, speech to far-end party, and on-hook signals. In-band signaling techniques include pulse and tone dialing. With common channel signaling, information is carried out-of-band.

Simple Network Management Protocol (SNMP): TCP/IP protocol that allows network management.

Simultaneous Voice Data (SVD): A technology for letting a user send data via a modem, and use a handset to talk to another user at the same time over the same connection. The alternative, making a second call, can be expensive or even impossible. The uses for SVD are telecommuting, videoconferencing, distant learning, tech support, etc.

Stop Bit: One of the variables used for timing in asynchronous data transmission. Depending on the devices, each character may be trailed by 1, 1.5, or 2 stop bits.

Superframe (D4): A T1 transmission format that consists of 12 DS1 frames, or 2316 bits. A DS1 frame consists of 193 bit positions. A frame overhead bit is in the first position, and it is used for frame and signaling phase alignment only.

Subscriber Loop: See “Local loop”.

Switched 56: A circuit-switched (full duplex digital synchronous data transmission) service that lets you dial a number and transmit data to it at 56K bps. It is a relatively low cost service, widely used in North America for telecommuting, videoconferencing and high speed data transfers. Many phone companies are (or will be) phasing out Switched 56 in favor of ISDN service.

Switched Virtual Circuit (SVC): A type of data transmission where the connection is maintained only until the call is cleared.

Switched Line: In communications, a physical channel established by dynamically connecting one or more discrete segments. This connection lasts for the duration of the call after which each segment can be used as part of a different channel. Contrast with leased line.

Switched Network: A network in which a temporary connection is established from one point via one or more segments.

Synchronous Data Link Control (SDLC): A discipline conforming to subsets of the Advanced Data Communications Control Procedures (ADCCP) of the American National Standards Institute (ANSI) and High-level Data Link Control (HDLC) of the International Organization for Standardization, for managing synchronous, code-transparent, serial-by-bit information transfer over a link connection. Transmission exchanges may be duplex, or half-duplex over switched or nonswitched links. The configuration of the link connection may be point-to-point, multipoint, or loop.

Synchronous Transmission: The transmission of data which involves sending a group of characters in a packet. This is a common method of transmission between computers on a network or between modems. One or more synchronous characters are transmitted to confirm clocking before each packet of data is transmitted. Compare to Asynchronous Transmission.

Systems Network Architecture (SNA): The description of the logical structure, formats, protocols, and operational sequences for transmitting information units through, and controlling the configuration and operation of networks.

T

Tariff: The rate/availability schedule for telephone and ISDN services from a regulated service provider.

TCP/IP: A set of communication protocols that support peer-to-peer connectivity functions for both local and wide area networks.

T Carrier: The generic name for a digitally multiplexed carrier system. In the North American digital hierarchy, a T is used to designate a DS (digital signal) level hierarchy. Examples: T1 (DS1) is a 1.544 M bps 24-channel designation. In Europe, T1 is called E1. The T Carrier system was originally designed for transmitting digitized voice signals, but has since been adapted for digital data applications.

T1: A digital transmission link capable of 1.544M bps. T1 uses two pairs of normal UTP, and can handle 24 voice conversations, each digitized at 64K bps. T1 is a standard for digital transmission in the U.S., Canada, Japan and Hong Kong. T1 is the access method for high-speed services such as ATM, frame relay, and SMDS. See also T Carrier, T1 line and FT1.

T1 Channel Tests: A set of diagnostics that vary by carrier, used to verify a T1 channel operation. Can include Tone, Noise Level, Impulse Noise Level, Echo Cancelers, Gain, and Crosstalk testing.

T1 Framing: To digitize and encode analog voice signals requires 8000 samples per second (twice the highest voice frequency of 4000 Hz). Encoding in an 8-bit word provides the basic T1 block of 64K bps for voice transmission. This “Level 0 Signal, as its called, is represented by “DS-0”, or Digital Signal at Level 0. 24 of these voice channels are combined into a serial bit stream (using TDM), on a frame-by-frame basis. A frame is a sample of all 24 channels; so adding in a framing bit gives a block of 193 bits (24x8+1=193). Frames are transmitted at 8000 per second (the required sample rate), creating a 1.544M (8000x193=1.544M) transmission rate.

T1 Line: A digital communications facility that functions as a 24-channel pathway for data or voice transmission. A T1 line is composed of two separate elements: the Access element and the Long Haul element.

T1 Mux: A device used to carry many sources of data on a T1 line. The T1 mux assigns each data source to distinct DS0 time slots within the T1 signal. Wide bandwidth signals take more than one time slot. Normal voice traffic or 56/64K bps data channels take one time slot. The T1 mux may use an internal or external T1 DSU; a “channel bank” device typically uses an external T1 CSU.

Transmission Control Protocol / Internet Program (TCP/IP): A multi-layer set of protocols developed by the US Department of Defense to link dissimilar computers across dissimilar and unreliable LANs.

Terminal: The screen and keyboard device used in a mainframe environment for interactive data entry. Terminals have no “box”, which is to say they have no file storage or processing capabilities.

Terminal Adapter (TA): An ISDN DTE device for connecting a non-ISDN terminal device to the ISDN network. Similar to a protocol converter or an interface converter, a TA connects a non-ISDN device between the R and S interfaces. Typically a PC card.

Tie line: A dedicated circuit linking two points without having to dial a phone number (i.e., the line may be accessed by lifting the telephone handset or by pushing a button).

Time-Division Multiplexing (TDM): Division of a transmission facility into two or more channels by allotting the common channel to several different information channels, one at a time.

Time Slot: One of 24 channels within a T1 line. Each channel has a 64K bps maximum bandwidth. “Time slot” implies the time division multiplexing organization of the T1 signal.

Toll Call: A call to a location outside of your local service area (i.e., a long distance call).

Tone dialing: One of two methods of dialing a telephone, usually associated with Touch-Tone® (push button) phones. Compare with pulse dialing.

Topology: Physical layout of network components (cables, stations, gateways, and hubs). Three basic interconnection topologies are star, ring, and bus networks.

Transmission Control Protocol (TCP): A communications protocol used in Internet and in any network that follows the US Department of Defense standards for internetwork protocol. TCP provides a reliable host-to-host protocol between hosts in packet-switched communications networks and in interconnected systems of such networks. It assumes that the Internet protocol is the underlying protocol.

Transport Layer: Layer 4 of the Open Systems Interconnection (OSI) model; provides reliable, end-to-end delivery of data, and detects transmission sequential errors.

Transport Protocol Data Unit (TPDU): A transport header, which is added to every message, contains destination and source addressing information that allows the end-to-end routing of messages in multi-layer NAC networks of high complexity. They are automatically added to messages as they enter the network and can be stripped off before being passed to the host or another device that does not support TPDU's.

Trunk: Transmission links that interconnect switching offices.

TSR (terminate and stay resident): A software program that remains active and in memory after its user interface is closed. Similar to a daemon in UNIX environments.

Tunneling: Encapsulation data in an IP packet for transport across the Internet.

Twisted pair wiring: A type of cabling with one or more pairs of insulated wires wrapped around each other. An inexpensive wiring method used for LAN and telephone applications, also called UTP wiring.

U

UART (Universal Asynchronous Receiver/Transmitter) (pronounced "you art"): A chip that transmits and receives data on the serial port. It converts bytes into serial bits for transmission, and vice versa, and generates and strips the start and stop bits appended to each character.

UNIX: An operating system developed by Bell Laboratories that features multiprogramming in a multi-user environment.

Unshielded Twisted Pair (UTP): Telephone-type wiring. Transmission media for 10BaseT

V

V.25bis: An ITU-T standard for synchronous communications between a mainframe or host and a modem using HDLC or other character-oriented protocol.

V.54: The ITU-T standard for local and remote loopback tests in modems, DCEs and DTEs. The four basic tests are:

- local digital loopback (tests DTE send and receive circuits),
- local analog loopback (tests local modem operation),
- remote analog loopback (tests comm link to the remote modem), and
- remote digital loopback (tests remote modem operation).

Virtual Circuit: A logical connection. Used in packet switching wherein a logical connection is established between two devices at the start of transmission. All information packets follow the same route and arrive in sequence (but do not necessarily carry a complete address).

W

Wide Area Network (WAN): 1. A network that provides communication services to a geographic area larger than that served by a local area network or a metropolitan area network, and that may use or provide public communication facilities. 2. A data communications network designed to serve an area of hundreds or thousands of miles; for example, public and private packet-switching networks, and national telephone networks. Contrast with local area network (LAN).

Wide Area Telecommunications Service (WATS): A low-cost toll service offered by most long distance and local phone companies. Incoming (800 call service, or IN-WATS) and outgoing WATS are subscribed to separately, but over the same line.

X

X.25: ITU-T's definition of a three-level packet-switching protocol to be used between packet-mode DTEs and network DCEs. X.25 corresponds with layer 3 of the 7-layer OSI model.

Y

Yellow Alarm: An error indication sent by the T1 device when it has not gotten a receive signal, or cannot synchronize on the receive signal received. Contrast "Red Alarm" and "Blue Alarm".

Z

Zero Byte Time Slot Interchange (ZBTSI): A method for allowing 64K bps unrestricted user data (allowing all 0s in the user data). An alternative to (but not as popular as) B8ZS.

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